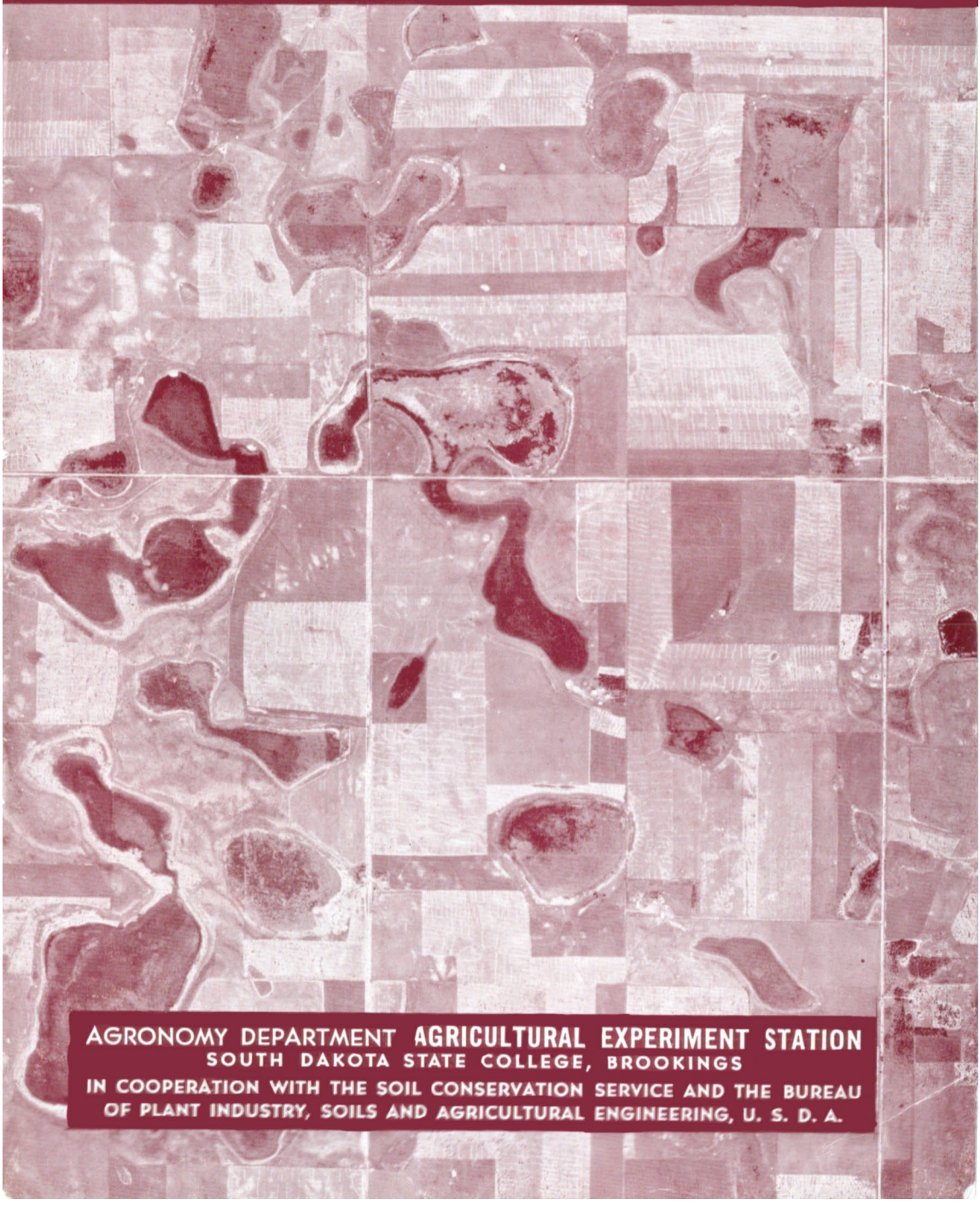
BULLETIN 421 MAY 1952

SOILS OF DAY COUNTY SOUTH DAKOTA



AGRONOMY DEPARTMENT AGRICULTURAL EXPERIMENT STATION
SOUTH DAKOTA STATE COLLEGE, BROOKINGS
IN COOPERATION WITH THE SOIL CONSERVATION SERVICE AND THE BUREAU OF PLANT INDUSTRY, SOILS AND AGRICULTURAL ENGINEERING, U. S. D. A.

Soils of Day County

South Dakota

AGRONOMY DEPARTMENT

Agricultural Experiment Station
South Dakota State College, Brookings

Cover Picture

The cover picture shows how a small but typical area of Day County looks from the air. Many lakes, ponds and wet depressions are scattered throughout the county. This is characteristic of much of Day County. Many of the deeper depressions had water in them at the time this picture was taken. These appear as very dark eliptical and elongated areas. Other depressional areas which did not contain water appear lighter in color.

Intermingling of light and darker colored areas along the western edge of the picture indicates erosion. Cultivation of the steeper slopes in that area together with erosion has exposed the lighter colored subsoil and substratum on many of the hills. These eroded spots show up as light colored areas. Barnes, Pierce and Buse soils occupy much of this area.

To the right (east) lie more gentle slopes. Sinai, Waubay and Barnes are the dominant soils in the eastern part of the picture.

Section line roads appear as long straight white ribbons. Grain shocks can be seen standing in many of the fields.

Picture courtesy of P.M.A., U.S.D.A.

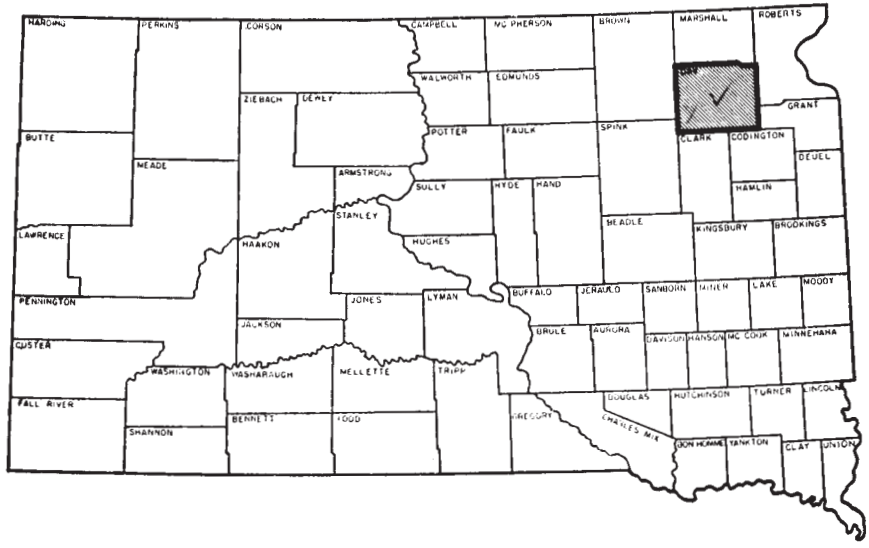


Fig. 1. Day County lies in northeastern South Dakota. Webster, the county seat, is about 53 miles by highway east of Aberdeen and 49 miles northwest of Watertown

Table of Contents

APPENDIX

Meanings of Some Technical Terms

Alkali soils—see saline soils

Alluvium—soil material of different sizes carried by running water and left on flood plains

Association—see soil association

Calcareous—containing enough limestone to effervesce or bubble when treated with hydrochloric acid

Coteau—see Prairie coteau

Clay pan—a layer of soil that is very high in fine clay, that is sticky and plastic when wet but hard when dry

Deltaic—alluvial deposits at or in the mouth of a river

Foot slopes—more gently sloping land at the base of higher hills or slopes

Friable—easily crushed or crumbled in the fingers; a desirable physical condition in soils

Glacial drift—any material carried by the ice or waters of glaciers and deposited either as layers or particles sorted by size or as mixed materials

Glacial outwash—coarse water separates such as sands and gravels which have been deposited in layers in valleys or on plains by water from the melting ice sheet

Glacial till—unsorted materials deposited by the glacial ice

Gravel lag—a thin layer or lens of gravel between soil horizons

Kettleholes—irregular depressions which have resulted from the melting of ice blocks buried in the glacial drift during glacial times

Laminations—thin layers of water-laid materials; pertains to the platy structure of these lacustrine soils

Land use capabilities—suitable land use for safe and permanent production

Loess—a blanket of wind-blown fine earth materials deposited over the surface of the land

Phase—a subdivision of a soil based on a characteristic which is significant to man's use on management of soils. Example—saline phase or stony phase

Puddled—refers to soils in which the original soil structure has been destroyed by working when wet

Prairie Coteau—a rolling tract of tree-less land lying at a higher elevation than the surrounding area

Saline soils—are those soils containing harmful amounts of salts which interfere with the growth of crop plants

Scabby—pertaining to areas where patches of clay pan or the heavy layer of soils have been exposed

Soil associations—pertains to two or more soils which are intricately interlaced with one another; where it was not possible or impractical to separate them they were placed together in an association

Soil horizon—a natural division or layer of soil which differs in appearance or characteristics from the layers above and below it

Soil series—a group of soils having similar horizons, except for the texture of the surface soil

Soil texture—refers to the percent of clays, silts, sands, and gravel or the various size groups of individual soil grains in a mass of soil

Soil type—a subdivision of the soil series based on the texture of the surface soil

Subsoil—refers to that portion of the profile which is below the surface soil

Substratum—any layer below the zone of weathering

Terminal moraine—a deposit of glacial drift, generally a series of hills or a ridge, which was formed at the edge of an ice sheet

Terrace—level or nearly level benches along streams and broad outwash flats. Normally the soils on these terraces are underlain with outwash sands and gravels

Topography—the lay of the land surface, such as nearly level, undulating or rolling topography.

Water table—pertains to free water in the soil profile or in the upper portion of the substratum. Soils with a high water table are normally poorly drained

Weathering—the disintegration and decomposition action of natural elements such as air, rain, freezing, thawing, plant life, etc., in the formation of soils

Soils of Day County South Dakota

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Introduction

Farmers of Day County will benefit the most from this soil survey report as it deals with their county and was written for their use; however, others located in northeastern South Dakota may find it useful (Fig. 1). Webster, the county seat, lies in the southeast corner of the county. It is 53 miles by highway east of Aberdeen, and 49 miles northwest of Watertown.

The soil map, in the folder attached to the back cover of this bulletin, has been divided into two sections, the eastern half and the western half. These maps show the distribution of different soils and associations of the soils that occur in the county. In the text, recommendations as to use, management, and conservation are made in an attempt to answer the major questions of the farmers and others interested in the soils of Day County.

What are the names of the soils? What slopes do they have? Are the soils stony, salty or droughty? The answers to these and other questions may be found by first locating the land area in which one is interested on the soil map. The list on the side of the map will tell what the numbers and letters on the map mean.

What crop yields can be expected from these soils? This information is given in the yield data tables on pages 37, 38 and 39.

What crop rotations and fertilizers will give the best results on these soils? See Table 4 on pages 42 and 43.

What are the soils and subsoils like? See the soil descriptions in the body of report, pages 14 to 36.

How much erosion has taken place in the county? What soil and water saving practices are recommended? Read the section on page 44 and paragraphs on use and management under respective soils.

What kind of climate prevails? How does the land lie? What systems of farming are commonly followed? These answers will be found in the section beginning on page 44.

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The field work for this survey was made by Elroy R. Lumb, USDA Soil Conservation Service, and completed in August 1951. The survey was inspected by C. A. Mogen, Division of Soil Survey, Bureau of Plant Industry, Soils and Agricultural Engineering, USDA.
The following persons participated in the preparation of the map and report: J. M. Beardsley, F. E. Shubeck and L. F. Puhr, of the South Dakota Agricultural Experiment Station, and G. A. Avery of the Soil Conservation Service.

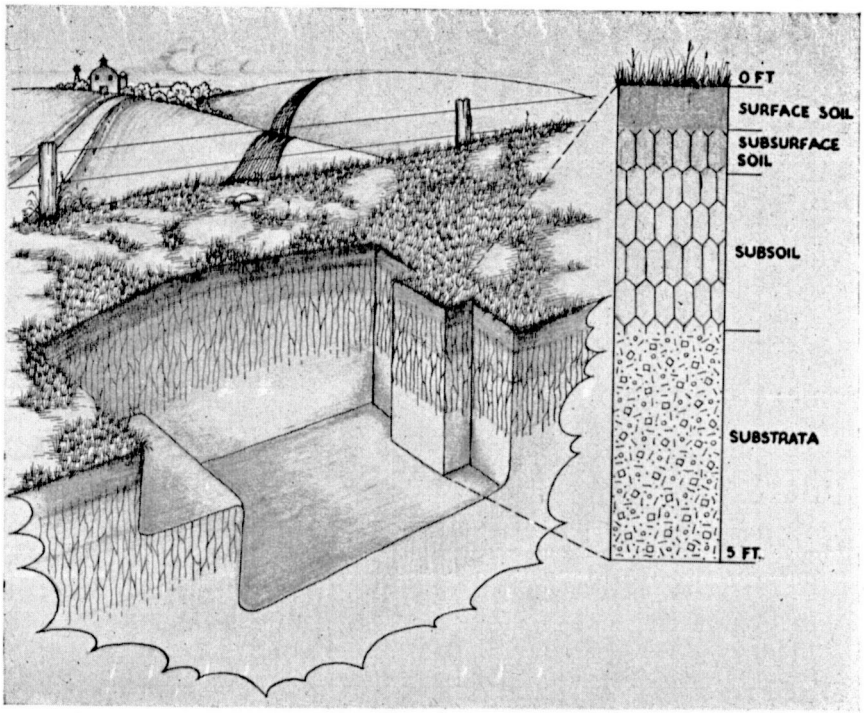


Fig. 2. Sketch of a major soil profile in the county showing the different layers of horizons which are found in the soil. This is a Barnes soil

How to Know Your Soils

A fresh road cut or excavation is a good place to see what a soil is like. Fig. 2 shows a soil profile of one of the major soil types found in the county.

A cross-section of a soil profile consists of several layers which are called "horizons." Each horizon differs from the horizons above and below. In the Barnes soil in Fig. 2 the following horizons are present:

1. Very dark brown or black surface soil.
2. A dark brown subsurface soil.
3. Olive-brown subsoil.
4. Light olive-brown, clay loam substratum.

Each soil type has a particular kind of profile. Soils are separated on the basis of their different profile characteristics. This separation is based on the character of all the layers or horizons that are within the profile and not on the character of the surface soil alone. The surface horizon of two soils may be identical, and yet the two soils may differ widely in agricultural value because of differences in one or more of the lower horizons. For example, the

presence of a heavy clay pan layer in one soil may result in much lower crop yields than those which would be obtained from a similar soil, without the clay pan or compacted horizon. It is important to understand that a given soil will include a range in characteristics and properties. The surface horizon of the Barnes soil is an example of this. It includes a range in color from very dark brown to black and a range in depth from 5 to 8 inches.

Boundaries between soil types may also vary in sharpness. A transition zone, which includes some of the characteristics of each soil type, is found between most adjacent soils.

Several soil types may be present on a single farm unit. A change from one soil type to another means that one or more of the layers in the soil profile has changed. A soil with a sandy surface may merge with one having a clayey surface. A well-drained soil may occur next to a poorly drained soil. Clay pan development in the profile may be present in one area and not in another. Scabby spots and areas high in soluble salts are present in some places and not in others. The lay-of-the-land or slope, varies from place to place giving rise to different drainage conditions in the soils. Stones are numerous in some areas and not in others.

These changes in the soil, from place to place, can only be determined by careful observation and examination of the entire soil profile. In Day County, soil surveyors have determined thousands of soil profiles by digging into them with a spade or a soil auger and by observing road cuts. Each time a change occurred in one or more soil horizons, a line was drawn on a map separating the two soils. These lines represent soil boundaries, and indicate where one kind of soil changes to another. They may also represent boundaries between different associations of soil types. Other lines separating slope and erosion phases of these soils and soil associations are also shown.

What the Soil Map Shows

The soil map shows the location and boundaries of various soil types and associations in the county. It also indicates the slope on which the soils occur and the amount of erosion that has occurred in each separation. Typical topographic positions, where some of the major soil types in the county may be found, are shown in Figs. 3 and 4.

It was not practical, in this survey to map all the soils in great detail. Instead, only the major soils were separated in detail from other soil types. Many minor soil types were either included with other soils or separated as associations on the detailed soil association map of Day County.

It is important to understand, that a soil type includes a range in characteristics. Care has been taken to show the important variations of the more common soils. Also, within an area of a soil type there are often distinct areas of other types too small to be separated on the soil map. These small areas have been

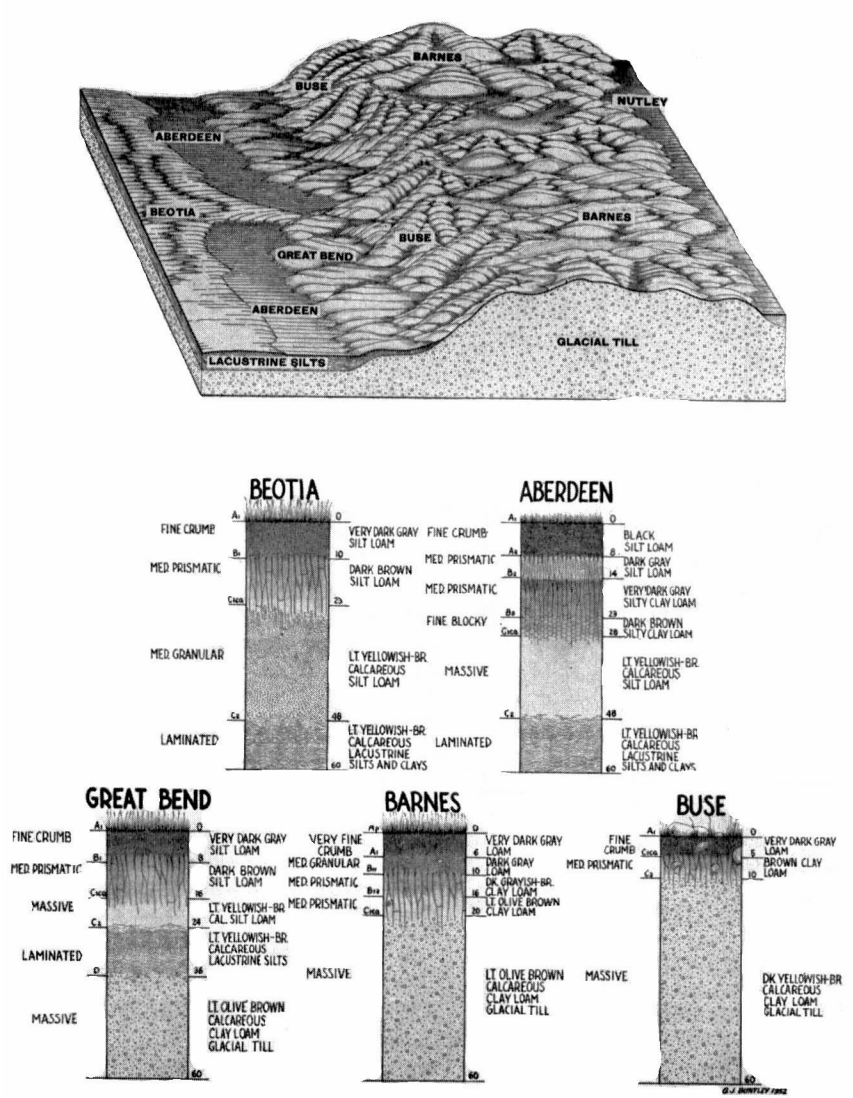


Fig. 3. Diagram showing the relative position of typical soils in the western part of Day County

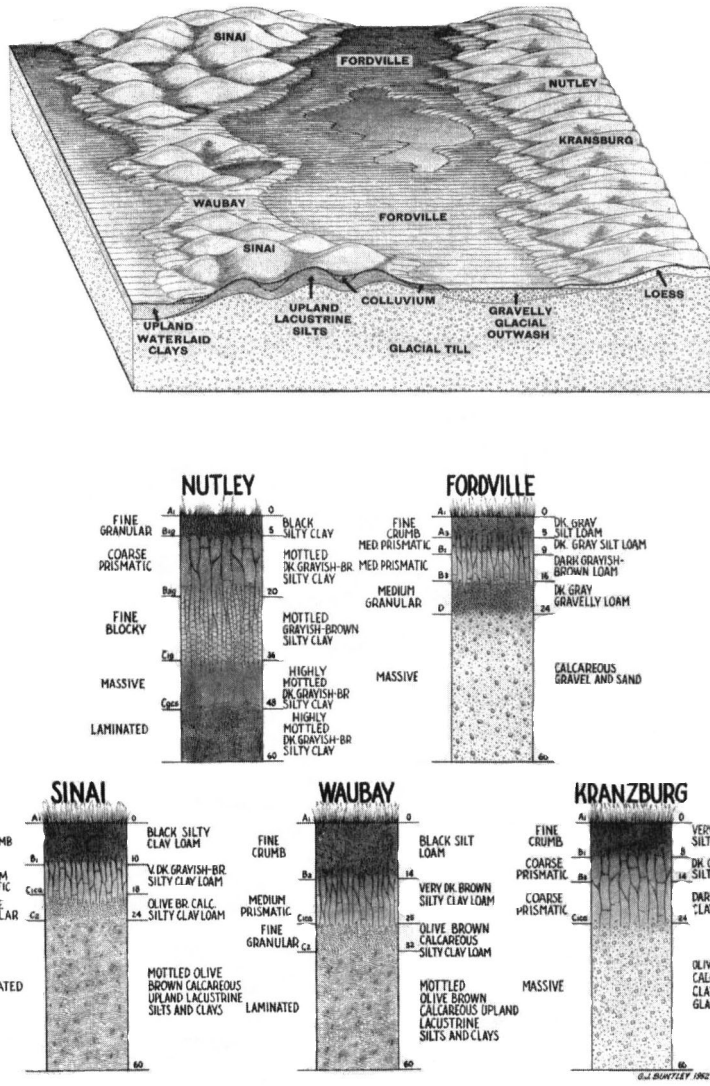


Fig. 4. Diagram showing the relative position of typical soils in the eastern part of Day County

included with the dominant soil type within the soil boundary line on the map. Other soil types are so intermingled with one another in very small deliniations that it was impossible and impractical to map them separately. These areas of intermingled soil types have been separated as associations of two or more soils. Sinai, Waubay and Barnes soils have been mapped in an association.

Characteristically each soil type has a certain range of slope. However, several types may occur within any one slope range. Differences in parent material, drainage, or native vegetation have caused different soil types to develop on similar slope ranges.

Soil Types: Individual kinds of soils are called "soil types." Just as Hereford cattle are called a beef breed or type, so is Barnes loam called a soil type. Two or more soil types can be distinguished from each other by the texture (fineness or coarseness) of the plow layer. For example, Fordville sandy loam will have a coarser textured surface soil than Fordville loam.

Soil Series: A soil series consists of one or more soil types. Groups of soils having horizons similar in their important characteristics but with surface soils of varying textures make up a series.

Soil Names: Soil series are named after geographic places where they were first observed. Some examples are Nutley silty clay loam which was named after Nutley Township in Day County, and Waubay silt loam named after the town of Waubay. All of the other soils mapped in Day County have also been named after places in either Day or other counties where these same soils had been mapped previously. To save space, abbreviations of soil types and associations have been used on the soil map accompanying this report. The soil legend on the side of the soil map will tell what these abbreviations stand for.

Slope, Erosion: The soil map also shows slope and degree of erosion. The slope of the land is expressed as the number of feet in a hundred that the land rises or falls. So a slope of 5 percent means 5 feet of rise or fall for each 100 feet of distance. On the detailed soil association map of Day County, level areas and slightly sloping land with less than 3 percent of slope were grouped together as A slopes; slopes of 3 and up to 5 percent were grouped under B; slopes of 5 and up to 9 percent were classed as C; while 9 percent and over were grouped as D slopes. These letters appear on the map, below or after the soil symbol.

The degree of erosion or the extent of soil removal from the surface by wind and water action is indicated on the map by the use of symbols also. Three classes of erosion are recognized in the county. Where 25 percent or less of the surface soil or topsoil has been removed, Class 1, or slight erosion has been mapped. Where more than 25 percent and less than 75 percent of the topsoil has been eroded, Class 2, or moderate erosion is shown. Where 75 percent of the topsoil and part of the subsoil has been removed by ero-

sion, severe erosion, or Class 3, has been mapped. On the soil map these numbers, representing the different classes of erosion, will be found after the slope letter.

Coloring Soil Map

Farmers who are interested in gaining a better picture of the soils on their farms may color the area they are interested in on the soil map. Coloring will help them to read and understand the map more clearly. A good set of crayons is satisfactory. Each soil separation may be colored a different color or several soils with like characteristics can be grouped together for each color.

A soil grouping based upon those soil characteristics that determine management requirements will be very useful to many farmers. Table 2 in the appendix lists each soil according to restrictions upon land use. If this grouping is used, all those soils which are listed under one particular heading such as good land, should be colored one color, those listed under the next heading another color and so on down the line. A suggested color scheme for this grouping is listed below:

Soil Grouping Based on Limitations in Use	Color
Good land, subject to moderate limitations	Yellow
Fair land, subject to severe limitations	Red
Land subject to severe limitations and suitable only for occasional cultivation	Blue
Land not suited for cultivation because of wetness or flooding hazard	Green
Land suited only for grazing or permanent hay	Orange
Land suited for watersheds, wildlife and recreation	Purple

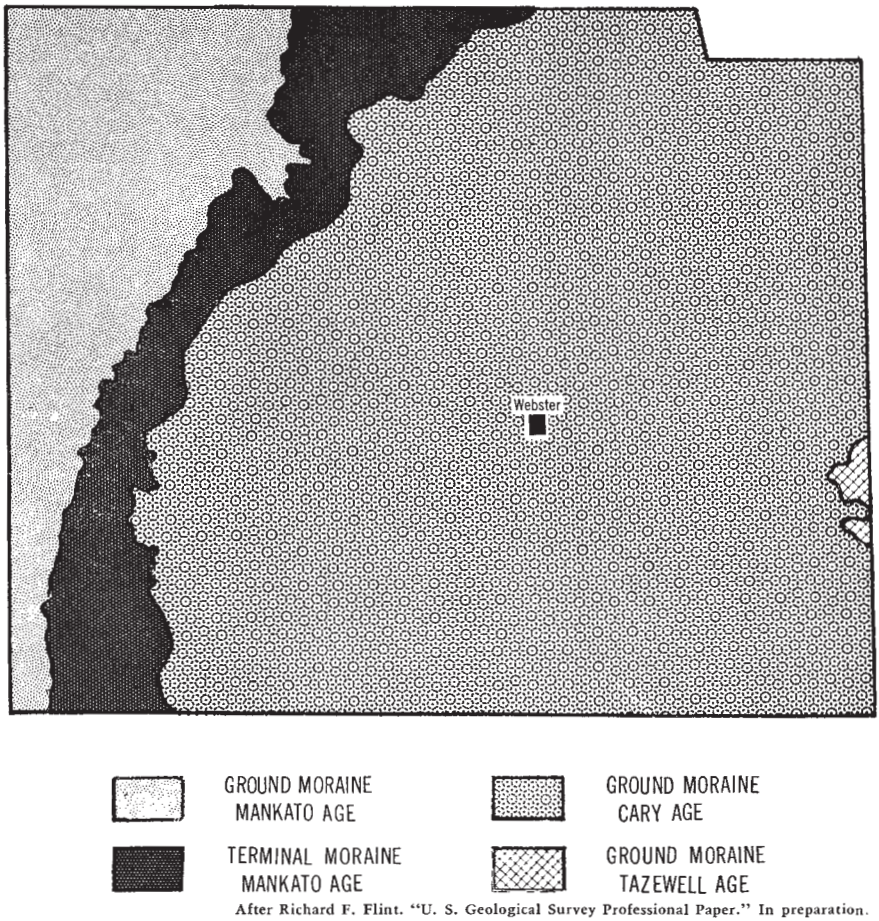
Soils of Day County

How the Soils Were Formed

The greater portion of Day County lies on the Prairie Coteau, an ancient plateau that was made hilly by erosion and then modified by glacial action. That portion of the county west of the Bristol Moraine lies within the prairie plains of the James River Valley. The Prairie Coteau or Coteau Hills ranges from 1800 to 1900 feet above sea level. The James River Valley is at a much lower level, its elevation being about 1400 feet above sea level. Both areas have been covered by glacial drift.

Four separate substages of the "Wisconsin ice sheet" overrode all, or parts, of Day County thousands of years ago. These ice sheets or glaciers laid down a blanket of glacial drift over all of the county. Much of this glacial drift was later reworked and sorted by wind and water action. The unsorted material left by the ice sheets is called glacial till. It consists of a mixture of clays, silts, sands, gravels and stones. Barnes and Buse soils are the most common soils on this material.

All of the area covered by the first substage was overlaid by succeed-



After Richard F. Flint. "U. S. Geological Survey Professional Paper." In preparation.

Fig. 5. The terminal moraine in the western part of the county is believed to be the end moraine of the Mankato ice sheet

ing advances of the ice. Only one small area of the second substage of the Wisconsin ice sheet was not covered up by the succeeding substages in Day County. It lies in Central Point Township along the eastern edge of the county (Fig. 5). This entire area was covered with a blanket of flour-like silt a long time ago. It is believed that this blanket of silt was laid down by dust storms at a time when the rest of the county was again covered by an ice sheet. Kranzburg is the dominant soil of this area. The topography is typical of the older till plains. It is characterized by a well developed drainage system and long gentle slopes.

The soils east of the Bristol Moraine have developed in materials deposited by the third advance of the ice sheet which was called the

Cary. Portions of this area may also have been covered with a blanket of flour-like silt laid down by dust storms. However, no concrete evidence of this is apparent in the county today. Other portions were covered with deposits of water-reworked materials. These water-sorted materials range in texture from sands and gravels to clays. Extensive areas of soils with sand and gravel substratums occur around the lake section in the eastern part of the county. Many of the smoother hills in this drift sheet are capped with medium-textured water separates. An extensive area of water-laid clays occurs in Valley Township just east of the Bristol Moraine. Smaller areas of these clay deposits occur all along the edge of this moraine on the Cary drift sheet.

The topography of this drift sheet varies from nearly level to rolling. Its surface is pitted with thousands of depressions which are occupied by marshes and lakes.

A fourth advance of the ice sheet, called the Mankato, came down the James Valley. It was a thin ice sheet and was not powerful enough to push very far up onto the Prairie Coteau. The Bristol Moraine is believed to be the end moraine of this ice sheet. The topography of this end moraine is very steep to rolling. Its western slopes are subject to erosion and several small streams have extended their headwaters into the moraine. West of the moraine, the topography is typical of the James Valley. The surface is usually gently undulating to nearly level. The soils on the foot slopes below the moraine have developed in thin water-laid deposits over glacial till. These water deposits become deeper on the nearly level topography west of the foot slopes. It is thought that blocked drainage during the Mankato substage caused back water from Old Glacial Lake Dakota to cover this section of the James Valley. Materials laid down at that time have given rise to the Beotia and Great Bend soils found in the area today.

Soil Types and Associations

The nature of individual soils and soil associations in Day County is determined by the lay-of-the-land, the kinds of material from which the soils were formed, the climate, and the types of vegetation or grasses which originally grew in the area.

A classification of the soils in Day County according to parent materials, lay-of-the-land, drainage, resistance to drought, and tendency to erode is given in Table 1 in the appendix.

There are several ways in which the soils of any particular county may be grouped. In Day County one of the most useful soil groupings may be made on the basis of its over-all agricultural value.

Soils grouped on the basis of their over-all agricultural value have been divided into four classes: First class soils—good farm land, second class soils—fair farm land, third class soils—land not suitable for extensive cultivation, and fourth class soils—land suited only for the grazing of livestock, for production of native forages, or for wildlife and recrea-

tion. See soils, and soil associations listed under these classes.

A second basis for separation or grouping of soils in this area is that of proper land use according to its capabilities. Groupings of the soils in Day County based on the limitations and erosion hazards are: (1) good land subject to moderate limitations, (2) fair land subject to severe limitations, (3) land subject to severe limitations and suitable only for occasional cultivation, (4) land not suited for cultivation because of wetness and flooding hazard, (5) land suited only for grazing or permanent hay, (6) land suited for limited or controlled grazing, and (7) extremely wet or swampy areas best suited for wildlife but which may provide limited grazing. This grouping of soils under land use capabilities may be found in Table 2 in the appendix.

The soils of Day County may also be grouped on the basis of topographic position under four main headings: soils of the uplands, terraces, lake plains, and bottomlands.

Upland soils, such as the Barnes, occupy the higher areas of ground moraine and steeper valley slopes. In Day County they consist of three broad divisions based on parent material: soils which have formed from the weathering of glacial till, those which have developed in water sorted materials, and those developed from the less extensive wind blown or loess materials. These soils have remained where they were formed except for some erosion. They are generally well drained and medium in texture.

Terrace soils are those which occupy river benches or the second and third bottoms as they are sometimes called and also broad outwash flats. The materials from which these soils have developed have been derived chiefly from coarse-textured water-laid glacial drift and from finer post-glacial deposits washed or blown over the top in the form of alluvium or loess. These soils lie on comparatively level topography. They are medium- to light-textured, well drained to excessively drained soils.

Lake plain soils occur on nearly level topography. The parent material consists of thin layers or laminations of water-laid sediments. These sediments were predominately silts and clays and were laid down as deltaic or lake deposits such as those in the Lake Dakota Basin. The soils are quite variable in their profile characteristics. Great Bend, Beotia, Aberdeen and Exline soils are the most common.

The bottomland soils occupy the flood plains or the first bottoms of the stream valleys. These soils are developing in more recent material washed down from the higher slopes and redeposited during periods of high water. The water table is normally quite high, and as a rule these soils are poorly drained.

FIRST CLASS SOILS
(Good Farm Land)

First class soils are the best agricultural soils in the county. They occupy level to gently sloping or undulating land areas. They are medium-textured soils with good

water-holding capacity for normal crop production. Drainage is good, both on the surface and down through the soil profile. There are no serious limitations to cultivation and crop production such as stones, clay pan, or erosion.

Aastad Silt Loam

Aastad silt loam is an upland soil developed over a loam or clay loam glacial till substratum. It occurs in the lower lying areas and on nearly level slopes in close association with the Barnes soils. All of this soil in Day County has been mapped in association with the Barnes soil. No separation of the acreage as to the proportion of each soil in the association has been made.

Soil Profile: Aastad silt loam is characterized by a deep, friable, dark gray surface soil 10 to 18 inches in thickness. The subsoil is dark grayish-brown in color, and from 12 to 24 inches thick. The substratum consists of a light yellowish-brown to light olive-brown gritty loam or clay loam with spots and streaks of lime.

Use and Management. Aastad silt loam is one of the better soils in Day County. Good yields of small grains, corn, and forages are obtained. This soil is moderately well drained and has the optimum or best moisture holding capacity for soils in this area. As a result, crops on Aastad silt loam do not show the effects of a drought as quickly as they do on some of the well-drained soils in the county.

Water erosion has removed some of the topsoil from the Aastad silt loam. This is especially true where the runoff from the slopes above has concentrated. Simple conservation practices on the slopes above the Aastad soil will prevent any serious damage in most cases.

Barnes Loam (3)[2]

Barnes loam is a well-drained upland soil developed over a loam or clay loam glacial till substratum. It ranges in depth from 18 to 24 inches. Although in some areas this soil occurs on steeper slopes which are more subject to erosion, the major portion of the Barnes is classed as good farm land. Approximately 12.74 percent of the county or 83,144 acres of Barnes loam has been separated from other soils and soil associations.

Soil Profile. Barnes loam is characterized by a 5- to 8-inch, very dark brown, friable surface soil. The dark color of this surface soil is due to accumulated organic matter. Below this is a dark brown, friable loam layer or horizon, usually 6 to 10 inches thick. The next layer consists of an olive-brown, compact, gritty loam, some 5 to 8 inches thick. The parent material or substratum is a light yellowish-brown to light olive-brown, gritty loam or clay loam. Spots and streaks of lime are present in the substratum. Small pebbles and grit are scattered through the entire profile.

Use and Management. Farmers on Barnes loam are concerned mainly with the production of small

[2]Number in parenthesis following the soil type or association is used to designate this type or association on the map.

grains, corn and forage crops. In years of normal rainfall, yields on this soil are moderate to good. Barnes loam is not normally a droughty soil, but yields of all crops, especially small grains and seed crops are lowered when droughts do occur. Some areas of Barnes are moderately stony, and in many cases it has been necessary to remove the stones so they do not interfere with tillage operations.

The Barnes soil is a relatively thin soil and retention of all the topsoil is essential for continued good crop production. During the dry "thirties," wind erosion caused severe damage in some areas where fields were left without vegetative cover. On the steeper slopes, water erosion has also removed some of the fertile topsoil. Simple conservation practices will prevent serious damage from erosion on much of the Barnes soil.

Barnes and Aastad Loams (2)

Where the Barnes loam and Aastad silt loam soils were so intermingled that it was impossible to separate them on the map, they were mapped together as an association. Approximately 10.9 percent of Day County, or 71,360 acres of this association, has been mapped.

Soil Profile. The soil profiles of the Barnes and Aastad soils in this association are identical with those already discussed under their respective series.

Use and Management. The use and management of this association is also quite similar to that discussed under the respective Barnes and Aastad soil series.

Beotia Silt Loam (7)

Beotia silt loam is a moderately well- to well-drained soil developed in thick medium-textured water-laid sediments. These sediments have been laid down in comparatively quiet slack water areas such as the Lake Dakota Basin. Nearly 1.7 percent or 10,880 acres of this soil type occurs in Day County.

Soil Profile. Beotia silt loam has a very dark brown to black, friable surface soil 8 to 15 inches thick. Below this is a layer of dark grayish-brown, friable, silt loam 12 to 15 inches in thickness. The parent material consists of very thin sheets or laminations of silts, clays and very fine sands which are grayish-brown to light olive-brown in color. Spots and streaks of free lime occur in this parent material but are most common in the upper portion. Small areas of Beotia, with loam or very fine sandy loam surface soils, have been included within the boundaries of this soil on the soil map. Their soil profiles are essentially the same as those described above except for the texture of the surface horizon.

Use and Management. Beotia silt loam is the most productive soil of the lake basins. Small grains, corn, flax for seed, and forages are all grown successfully on this soil. Very good yields are obtained during years of average or near average rainfall.

A large percentage of the Beotia is only moderately well drained which gives it the advantage of a better soil-moisture-plant relationship. A good crop rotation, which includes a legume, will help to main-

tain the productiveness of this soil.

Even though Beotia silt loam occurs on level or nearly level topography, some erosion has occurred. In the drier years, where no protective crop residues were left on the fields, wind erosion caused serious damage.

Beotia Silt Loam, Moderately Deep Over Till

This soil has developed in moderately deep, medium-textured, water-laid sediments over glacial till. Beotia silt loam, moderately deep over till is a moderately well-drained to well-drained soil. It occurs in close association with the Great Bend west of the Bristol Moraine on the gently undulating foot slopes leading down to the Lake Dakota Basin. No attempt was made in this survey to separate this soil from the Great Bend.

Soil Profile. Beotia silt loam, moderately deep over till, has a very dark brown to black, friable surface soil 8 to 12 inches thick. The subsoil is a dark grayish-brown, friable, silt loam 10 to 14 inches in thickness. Both of these two upper horizons have developed in medium-textured water-laid sediments and are comparatively free of grit and stones. The underlying material consists of a light grayish-brown or olive-brown, gritty, clay loam glacial till. Stones, bits of shale, and spots and streaks of free lime occur in this glacial till. The thickness of the water-laid sediments over the glacial till in which this soil has developed varies from place to place. A thin layer of gravel or a sandy lag sometimes occurs between the lake-laid sediments and the glacial till substratum of this soil.

Use and Management. The moderately deep Beotia silt loam is very similar to Beotia silt loam as to use and management. It is a highly productive soil and produces good yields of small grains, corn, flax for seed, and forages. Like the Beotia in the Lake Dakota Basin, a large percentage of this soil is only moderately well drained, which gives it an optimum soil-moisture-plant relationship. Cropping practices which include a good rotation with legumes will help to maintain the relatively high productivity of this soil.

Simple conservation practices will help prevent any serious loss of soil in most cases. Good cropping practices and the use of crop residues will help protect the surface soil from wind erosion. Grassed waterways to carry away runoff water from the slopes above will help control water erosion.

Egeland Loam and Sandy Loam (10)

This soil occurs on undulating to nearly level topography. It is a well-drained to somewhat excessively-drained soil developed in water-laid materials over water-washed sands. Approximately 12,800 acres of this soil have been separated from other soils in Day County.

Soil Profile. A dark gray or black, friable layer, 8 to 12 inches thick characterizes the surface soil. The subsoil below is a dark grayish-brown to dark yellowish-brown loam or sandy loam layer 10 to 20

inches in thickness. This rests on a grayish-brown or olive-brown substratum composed of water-laid sands with some finer materials. Free lime is generally present in the upper part of the substratum.

Use and Management. Egeland loam and sandy loam is almost as productive a soil as Fordville loam. Moderate to good yields of small grains, corn and forages are obtained in years of near normal rainfall. Since this soil occurs on nearly level topography and is easily tilled, most of it is under cultivation at the present time. Although this soil may be somewhat droughty it is usually not as droughty as the Fordville.

Wind erosion is a problem on Egeland soils and care must be taken to maintain a cover of crop residue on the surface as much of the time as possible. In the past, wind erosion has resulted in severe damage to many fields which were not protected by either a crop residue or some other conservation measures.

Fordville Loam (14)

Fordville loam has developed in 18 to 36 inches of sediments over coarser sands and gravels. It occurs on stream benches or terraces and on outwash flats. Its total area in the county is relatively large. Approximately 3.6 percent or 23,040 acres of Fordville soils have been separated from other soils and associations in the county. Almost all of this soil occurs on the more level slopes and falls into the category of first class soils.

Soil Profile. The surface soil is a friable, very dark brown to black layer 6 to 10 inches deep. The subsoil grades from a very dark brown in the upper portion to dark brown in the lower part. It ranges in texture from a clay loam to a sandy loam and from 10 to 18 inches in thickness. The upper part of the substratum may have developed in sands and gravels or in sediments resting over the sands and gravels. It is dark grayish-brown in color and contains free lime. The sands and gravels below are generally very loose and porous.

Use and Management. Fordville soils occur on nearly level to gently undulating slopes and are easily tilled. Moderate to good yields of all crops grown in the area are obtained in years of normal rainfall. Where the sands and gravels occur fairly close to the surface, this soil is somewhat droughty. Drainage is good to excessive.

Both soil and moisture conserving practices are necessary for the best management of Fordville loam. Since this soil tends to be droughty, early maturing crops should be used. Wind erosion is a problem and care must be taken to maintain a cover of crop residue on the surface as much of the time as possible. Although most of the Fordville loam occurs on nearly level land, a small proportion does occupy steeper slopes. The Fordville on these steeper slopes is more subject to the hazards of water erosion. Special care must be taken to prevent the loss of any soil and the resulting loss in productivity.

Great Bend Silt Loam, Moderately Deep Over Till

Great Bend silt loam has developed in moderately deep, medium-textured, water-laid sediments over glacial till. All of this soil in Day County has been mapped west of the Bristol Moraine on the gently undulating foot slopes leading down to the Lake Dakota Basin. Great Bend silt loam is a well-drained soil occurring on very gentle slopes in close association with the Beotia soil. In this survey all of the Great Bend silt loam has been mapped in association with the Beotia soil. No separation of the acreage as to the proportion of each soil in the association has been made.

Soil Profile. Great Bend silt loam has a very dark brown, friable, surface soil 6 to 10 inches thick. Below this is a dark grayish-brown to olive-brown, friable, silt loam layer 4 to 10 inches in thickness. Both of these two upper horizons have developed in water-laid sediments and are comparatively free of grit and stones. The substratum below consists of a light grayish-brown or olive-brown, gritty clay loam. Spots and streaks of free lime, bits of shale and stones are present in this substratum. The thickness of the water-laid materials over the glacial till substratum varies considerably from place to place. It may range from several inches deep, near the Bristol Moraine, to several feet deep near the lake bed proper. In small local areas a thin layer of gravel or a sandy lag may occur between the contact of the lake-laid sediments and the glacial till substratum.

Use and Management. Nearly all of the Great Bend silt loam in Day County is under cultivation. Good yields of small grains, corn, flax for seed, and forages are obtained. A good crop rotation, which includes a legume, and the use of some commercial fertilizer will help maintain the productiveness of this soil.

Since Great Bend silt loam occurs on nearly level to gently sloping topography water erosion has not been a serious problem. However, in the drier years, when no protective cover of crop residues was left on the fields, wind erosion resulted in the loss of some fertile topsoil. Also, many drainage ways and several small streams have their headwaters in the western edge of the Bristol Moraine. These drains and streams flow westward across the area where the Great Bend soil occurs. Protection from stream bank and drainage channel erosion is a problem in some of these waterways. Technical assistance from the County Agricultural Extension Agent or from the Soil Conservation Service should be obtained if special practices are needed.

Great Bend and Beotia Silt Loams, Moderately Deep Over Till (17)

This association occurs west of the Bristol Moraine on the foot slopes leading down to the Lake Dakota Basin. It was not possible in a survey of this kind to separate these two soils on the map. Great Bend silt loam, moderately deep over till, comprises the largest percent of this association. About 9.3 percent of Day County, or 59,502 acres of this association, has been mapped.

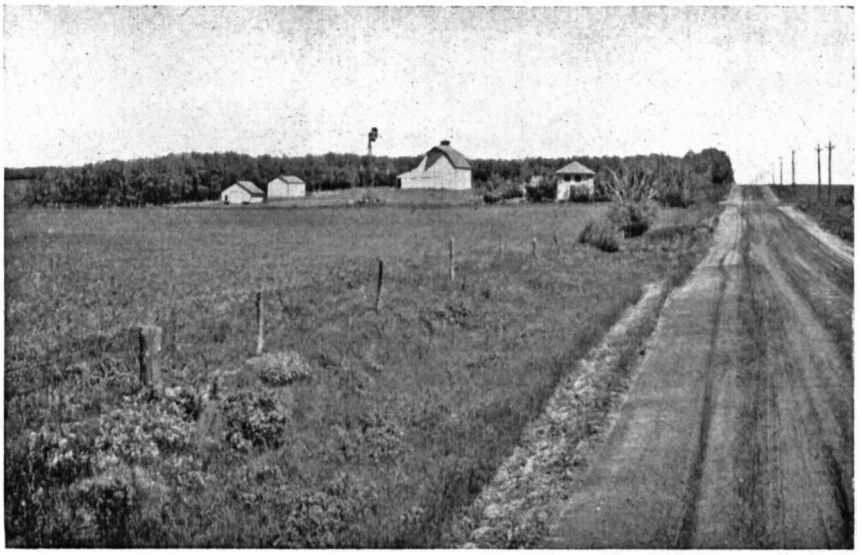


Photo by Soil Conservation Service

A typical farmstead on Great Bend and Beotia silt loam in Day County

Soil Profiles. The soil profiles of the Great Bend and Beotia silt loams, moderately deep over till, in this association are the same as those already discussed under the respective series.

Use and Management. The use and management of both soils in this association are almost identical and will follow those discussed under the respective series very closely.

Kranzburg Silt Loam (18)

Kranzburg silt loam is a well-drained upland soil developed in a blanket of wind-blown materials deposited over a clay loam glacial till substratum. Almost all of this soil in the county falls into the grouping of first class soils. Some 2,432 or 0.4 percent of the county has been classified into this soil type.

Soil Profile. Kranzburg silt loam is characterized by an 8- to 10-inch very dark brown, friable surface soil. The subsoil is dark grayish-brown silt loam in the upper part, grading to dark brown in the lower portion. It ranges in thickness from 12 to 18 inches and may have spots and streaks of free lime in the lower portion. The substratum is a light olive-brown clay loam glacial till. Scattered stones may be found on the surface, but as a general rule the upper portion of this soil is stone free.

Use and Management. The Kranzburg soil is one of the most productive soils in Day County. Good yields of small grains, corn, flax seed and forage crops are obtained under good management practices. Lack of stones in the upper portion of the profile and greater depth to the substratum makes this a better soil than the Barnes.

Lack of vegetative cover and improper farming methods have resulted in serious damage to some fields from both water and wind erosion. Erosion control measures on the Kranzburg soil will help prevent further loss of fertile topsoil.

Nutley Silty Clay Loam (23)

Nutley silty clay loam has developed in clayey, water-laid materials on the upland. It occurs in relatively small areas along the east side of the Bristol Moraine in Day County. There are only about 5,860 acres of this soil, comprising about 0.9 percent of the county.

Soil Profile. The surface soil is very thin, ordinarily less than 6 inches deep. It is very dark brown to black in color. The silty clay loam subsoil is 8 to 10 inches thick, is dark olive-brown in color and contains free lime in the lower part. Tongues and streaks of dark organic staining from the surface soil have carried down into this horizon. The parent material is a calcareous, light olive-brown silty clay.

Use and Management. Nutley silty clay loam is a productive soil. Small grains and forages, especially alfalfa, yield well. Although internal drainage in this soil is very slow, corn suffers quite severely if short periods of drought occur during the growing season. Short periods of drought also cause cracks to develop in the surface of this soil. These cracks allow some moisture to escape from the soil and may cause mechanical injury to crop roots.

Even though this soil occupies gently sloping land, erosion has been severe. It is subject to both wind and water erosion. A protective cover of crop residue should be left on the surface as much of the time as possible. Besides protecting the soil from wind erosion, crop residues will help the physical structure of the soil by providing needed organic matter. Other conservation practices will help prevent the loss of this thin topsoil.

Sinai Silt Loam

Sinai silt loam is found on the undulating uplands east of the Bristol Moraine. It occurs on the tops and part way down the slopes of many of the smoother hills and rises. Most of this soil mapped in the county falls into the grouping of first class soils. Sinai silt loam occurs in such a complex pattern with other soils that no acreage of it has been separated in the county.

Soil Profile. The surface soil of Sinai silt loam consists of a friable, very dark brown or black layer 8 to 14 inches thick. The silt loam subsoil ranges from 10 to 16 inches in thickness and is very dark grayish-brown in color. The parent material below the subsoil consists of very thin layers of silts, clays and sands which are olive-brown in color. Thin beds or strata of coarser materials such as gravels may also occur between the layers of finer sediments in the substratum or between the subsoil and substratum. This parent material is generally very calcareous, and spots and streaks of lime are quite common in the upper portion.

Use and Management. Farmers on Sinai silt loam produce good

yields of small grains, corn and forage crops. Many excellent dairy farms are found on this soil. The fact that Sinai silt loam ranges from moderately well-drained to a well-drained soil gives it a good soil-moisture-plant relationship.

Water erosion is not a serious problem on the more gently sloping areas. However, the longer and steeper slopes are more subject to the hazards of water erosion. Special care must be exercised to prevent the loss of fertile topsoil from these areas. Good rotations, the use of crop cover, and good conservation practices will help maintain the productivity of this soil.

Sinai Silty Clay Loam (29)

Sinai silty clay loam occurs on the undulating uplands in close association with the Sinai silt loam. All of this soil mapped in Day County falls into the classification of first class soils. Only 6,528 acres or 1.0 percent of the county consists of this soil type.

Soil Profile. Sinai silty clay loam differs from Sinai silt loam in having a heavier textured surface and subsoil. It may also have more clay in the substratum than the Sinai silt loam.

Use and Management. Relatively good yields of small grains, corn and forage crops are obtained from this soil when it is properly managed. A rotation which includes grasses and legumes will help maintain a good physical structure in the surface soil. It will also help prevent the loss of topsoil by erosion. Although erosion is not too serious a problem on this soil, some care must be exercised, especially on the steeper slopes.

Waubay Silt Loam

Waubay silt loam is an upland soil occurring in close association with the Sinai soils. It occupies the lower and more level slopes. All of the Waubay in Day County is included under the heading of first class soils. No acreage of this soil has been separated from the association in which it occurs.

Soil Profile. Waubay silt loam is characterized by a deep, dark gray to black surface soil ranging from 12 to 18 inches in depth. The silt loam subsoil is very dark grayish-brown in color and is 14 to 28 inches in thickness. The subsoil may be calcareous in the lower portion. The substratum consists of a light yellowish-brown to light olive-brown, gritty clay loam glacial till, or of thin laminations of water-laid silts and clays. Thin beds of sands and gravels may also occur in the substratum.

Use and Management. Waubay soils are among the most desirable farming soils in Day County. Moderately high yields of all crops common to the area are obtained. They have an optimum moisture holding capacity for good crop production. Accumulation of topsoil washed down from the adjacent uplands has helped build it up. In wetter years, some lodging of small grains may occur on the flatter areas.

Although this soil occurs on nearly level topography, it is subject to water erosion. Large quantities of runoff from the slopes above has re-

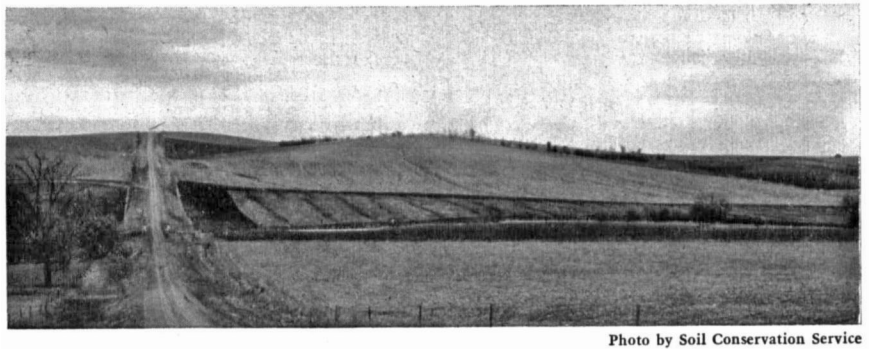


Photo by Soil Conservation Service

Typical land form where the Sinai and Waubay silt loams and Barnes loam association is found. Sinai occurs on the rounded tops of the hills and part-way down the slopes. Barnes loam occupies the steeper slopes and Waubay occurs on the gentle slopes and in the valleys between the hills

sulted in ditches and gullies, in many cases. The construction of diversion ditches and terraces on the slopes above, and the seeding of grass in waterways are some of the most important practices for controlling erosion and maintaining the continued high production of this soil.

Sinai and Waubay Silt Loams and Barnes Loam (30)

These three soils occur in such a complex pattern in Day County that it was impossible to separate the three and show them on the map in this survey. They were mapped together as an association. Many small knobs or knolls underlain by glacial till also occur in this association. It was not practical nor possible to separate all of these small till knobs, since many of them are only a few feet in radius. Some of these knobs have gravelly profiles. In some cases erosion has removed the thin surface soil which was originally present and exposed these gravelly spots. The total area these thin till soils occupy in this association is very small in comparison to that of the Sinai, Waubay or Barnes soils. Nearly 14.2 percent of the county or 91,820 acres of this association has been mapped.

Soil Profiles. The soil profiles of the three major soils in this association are the same as those discussed under the respective series on pages 22, 21 and 15.

Use and Management. Use and management of these soils will also follow closely those discussed under the respective series.

Tolley Loam (37)

Tolley loam occurs on undulating topography and is associated with both the Barnes and Fordville soils. Tolley loam has developed in glacial till and has a layer of gravelly, sandy loam or loose gravel and sand within 30 inches of the surface. Although the major portion of it has been mapped in the northeastern part of the county, small scattered areas are found throughout the Prairie Coteau. Approximately 2,688 acres of Tolley loam have been separated in the county.

Soil Profile. The surface soil is dark gray to black in color and 5 to 10 inches thick. This grades into a grayish-brown or dark brown, friable loam subsoil 10 to 20 inches in thickness.

The upper part of the substratum consists of a light yellowish-brown to olive-brown, highly calcareous loam with many spots and streaks of free lime. This layer is normally not over 8 to 10 inches in thickness, or it may not be present at all. If the above layer is present, it grades into a grayish-brown to olive-brown gravelly, sandy loam or loose sands and gravels 6 to 10 inches in thickness. The undersides of the coarser gravels are white with a lime coating. Below this a brownish-gray to olive-brown clay loam glacial till occurs.

Use and Management. Tolley soil occurs on nearly level to undulating slopes. It is easily tilled and moderate to good yields of all crops common to the area are obtained. Tolley soil, although not quite as productive, compares very favorably with Barnes soils in agricultural value.

Tolley loam is susceptible to both water and wind erosion. On the more sloping land, water erosion has removed some of the relatively thin topsoil. Wind erosion has also caused quite severe damage in some areas especially during the dry "thirties." Since this soil does have a coarse-textured layer in its profile, it is slightly more droughty than the Barnes soil. Both soil and moisture conservation are essential if this soil is to be maintained at its highest level of productivity.

SECOND CLASS SOILS

(Fair to Good Farm Land)

The soils in this class rate somewhat lower than those in the first class because of droughtiness, poor drainage, or some other limiting factor which results in reduced crop yields or limits their use capabilities to some extent. With good treatment, some second class soils can be brought to a level of productivity comparable with first class soils. Some improvements plus skillful management are needed to produce these results. In the main, second class soils will produce good crop yields when well managed, but only fair yields under poor management without improvements.

Aberdeen Complex (1)

Aberdeen is a moderately well to somewhat poorly drained soil developed in medium-textured, waterlaid sediments in the Lake Dakota Basin. This soil in Day County is a complex of soils ranging from extreme clay pan development to no clay pan development in the subsoil.[3] Approximately 30 percent of the areas mapped as Aberdeen has little or no clay pan present, 50 percent has a moderately heavy clay pan, and 20 percent consists of soils with extremely heavy clay pan subsoils. Aberdeen silt loam accounts for about 7,232 acres or 1.1 percent of the county.

Soil Profile. The upper part of the surface soil of a typical Aberdeen silt loam is friable, black in color and from 6 to 10 inches thick. The

[3]Clay pan development in this soil is the result of a combination of restricted internal drainage and a high soluble salt content.

lower part of the surface soil is only a few inches in thickness and is dark gray to gray in color. This grades abruptly into a very dark gray, heavy clay loam or clay pan layer which is 8 to 14 inches thick. Below the clay pan the subsoil is lighter in color and contains crystals of salt. Spots and streaks of free lime are also present. The substratum is olive-brown to light olive-brown in color. It consists of very thin layers of silts, clays and fine sands.

Use and Management. Because of poor internal drainage and clay pan development, crops suffer from excess moisture in wet seasons and from drought in dry seasons. Small grains and forages, principally alfalfa, do fairly well on Aberdeen silt loam in normal years. Corn is not so well adapted, and only poor to fair yields can be expected over a period of years.

Wind erosion has been quite severe on some fields. This is especially true where fields were left without a vegetative cover a large proportion of the time.

Beadle Silt Loam (6)

Beadle silt loam has developed in a moderately heavy clay loam glacial till on the upland. Several small areas of this soil have been separated along the west county line. Only 380 acres of this soil have been mapped.

Soil Profile. The surface soil is a friable silt loam, ranging from 6 to 10 inches in thickness. It is very dark brown to black in color. The subsoil is a heavy clay loam 10 to 16 inches thick. The upper part is dark grayish-brown in color grading into an olive-brown below. It may be slightly calcareous in the lower portion. The parent material consists of dark grayish-brown to olive-brown clay loam glacial till. Many spots and streaks of segregated or free lime, salt crystals and large pieces of unweathered Pierre shale occur in this substratum.

Use and Management. Beadle soils occur in close association with, but are not as productive as, the Barnes soils. Small grains, corn and forages are commonly grown on this soil. Yields in years of normal precipitation are only fair to moderate. Most of the Beadle soil occurs on gently sloping topography and their management is almost identical with that of the Barnes.

Fordville Fine Sandy Loam (13)

Fordville fine sandy loam occurs in close association with Fordville loam on stream benches and on outwash flats. A relatively small percent of the county is made up of this soil type. However, like the Fordville loam, only a small portion or 9,600 acres in the county have been separated from other soils and associations.

Soil Profile. The soil profile differs from that of Fordville loam only in the texture of the surface soil.

Use and Management. Fordville fine sandy loam is more droughty than Fordville loam. Its moisture holding capacity is lower, and as a result crop yields on this soil are lower.

Fordville fine sandy loam is also more subject to wind erosion and even greater care must be exercised

to prevent the loss of topsoil. Maintaining a cover of crop residues on the surface as much of the time as possible will help prevent serious erosion.

Fordville and Sioux Loams and Sandy Loams (15)

Where the Fordville loam and Sioux sandy loam occurred in very small areas which were so intermingled that it was impossible to separate the two, they were mapped together as an association. The largest proportion of this association consists of Fordville loam. Nearly 7,680 acres of this association have been separated in the county.

Soil Profile. The soil profiles of the Fordville and Sioux soils in this association are identical with those discussed under the respective soil types on pages 18 and 32 of this report.

Use and Management. Most of the Fordville loam in this association is not as deep to sand and gravel as the normal profile. As a result, both the Fordville and Sioux soils in this association are quite droughty. Crop yields are generally low except in years of above normal rainfall during the growing season. This association may be best utilized by growing a drought resistant grass-legume mixture.

When left without a vegetative cover these soils are very susceptible to wind erosion. Maintaining a good stand of grasses and legumes on this association as much of the time as possible will help control erosion.

Lamoure Silt Loam, Slightly Saline (19)

Lamoure silt loam is a somewhat poorly drained soil occupying the higher bottoms along streams and large intermittent drainage channels. It has developed in sediments deposited by periodic flood waters. This soil varies considerably in depth and in character of the underlying material. Approximately 1.6 percent of the county, or 10,560 acres of this soil, has been mapped.

Soil Profile. Lamoure silt loam has a 9- to 14-inch layer of friable, black surface soil which is commonly calcareous. The subsoil ranges in depth from 1 to 3 feet or more. It is highly calcareous and very dark colored, with spots and streaks of gray and rust scattered throughout. The spots of gray and rust are a result of poor drainage or of a high water table in the profile during some parts of the year. The substratum may contain thin layers of coarser materials although it is normally much heavier in texture. Small soluble salt crystals may also be seen in the substratum.

Use and Management. Because of spring flood hazards and slow drainage, most of this soil falls into the class two soils of the county. Some of the better drained areas may be placed with the first class soils. Although it is slow to dry out in the spring, Lamoure silt loam is suitable for cultivation in most years. Forages and corn are the principal crops. Some small grains are also grown, but their production is somewhat hazardous due to flooding and lodging. When only a small part of the farm unit consists of Lamoure silt loam, that area is generally left in forages.

Erosion is seldom a major problem on this soil. Occasionally, flash floods may cut new channels through these soils.

Nutley Silty Clay (22)

Nutley silty clay has developed in clayey, water-laid materials on the upland. It occurs along the east side of the Bristol Moraine in Day County. The largest area of it is found in Valley Township. Approximately 4,480 acres of Nutley silty clay have been mapped in the county.

Soil Profile. The surface soil is a heavy black silty clay 5 inches deep. The subsoil is a firm silty clay ranging from 16 to 20 inches in thickness, and from dark grayish-brown in the upper part to light olive-brown in the lower portion. Tongues and streaks of darker colored surface soil are found in the subsoil. The parent material consists of thin layers of calcareous silty clays which are olive-brown in color. Large salt crystals and some lime spots are found in the substratum.

Use and Management. Even though the surface drainage on this soil is good, the internal drainage is very slow. The dense clayey material in which this soil has developed restricts the movement of water through the profile. Crops suffer from poor aeration during wet seasons and from drought during dry seasons. Short periods of drought and drying causes the surface soil to crack open. When this happens crop roots are broken and in many cases they are exposed to the air. Forages and small grains are most suitable for this soil. Moderate yields are obtained. Nutley silty clay is hard to work and care must be taken in its cultivation to prevent unfavorable physical conditions from developing, such as compaction of the surface soil.

Some wind and water erosion has occurred, but as a general rule good management practices which include some simple conservation practices will help control erosion on this soil.

Nutley Silty Clay Loam and Buse Loam (24)

This association occurs in Nutley Township. It consists of small knobs or hummocks of shallow Buse soils surrounded by Nutley soils. It was not possible to separate these two soils in this survey. About 704 acres of this association have been mapped in the county.

Soil Profiles. The soil profiles of both Nutley silty clay loam and Buse loam are the same as those discussed under the respective series on pages 27 and 34.

Use and Management. This association may be best utilized for the production of pasture and forages. Although the areas of Nutley silty clay loam in this association are suitable for the production of corn and small grains, the Buse soils are not. Since these two soils occur in such an intricate pattern it is almost impossible to farm one without farming the other.

THIRD CLASS SOILS

(Land not Suited for Intensive Cultivation)

The soils in this class have been rated lower because of more limit-

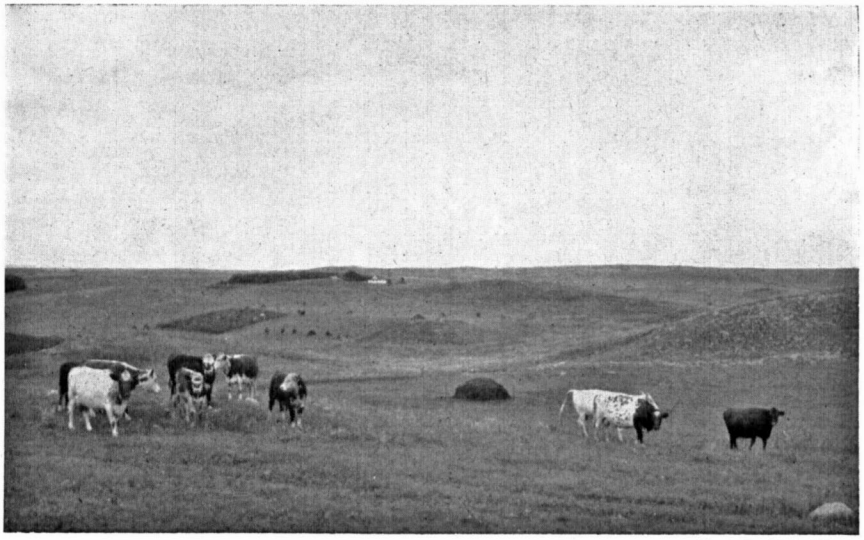


Photo by C. A. Mogen

Cattle grazing on steeply sloping Buse and Barnes soils in Day County. Several stony ridges may be seen in the background

ing factors. Improvement of these soils for tillage is seldom economical. Some of these soils, such as Sioux loam, are cultivated, but average yields are very low. Usually these cultivated areas are small and occur in close association with better soils. The poorly drained soils in this class are almost entirely devoted to permanent pasture or native forage production. When properly drained, some of the depressional soils in this class may be grouped with second class soils.

Barnes Loam and Pierce Gravelly Sandy Loam (4)

Where the Barnes and Pierce soils were so intermingled that it was not possible to separate the two, they were mapped together as an association. In this association, Barnes is the dominant soil with small hills or knobs of Pierce making up the remainder. The Pierce knobs are usually quite gravelly on the surface. Crops growing on these soils generally indicate where the Pierce soils occur in this association by their poorer growth. About 3,200 acres of this association have been separated in Day County.

Soil Profiles. The profile characteristics of the Barnes and Pierce soils in this association are the same as those discussed under the respective series on pages 15 and 35.

Use and Management. Since the major portion of this association occurs on undulating topography it is subject to the hazards of water erosion. Special care must be exercised to prevent loss of the thin topsoil and a consequent lowering of productivity. A crop rotation which includes several years of forage crops for each year of cultivated crop is

recommended for this association.

Buse and Barnes Loam (8)

Buse and Barnes loam occur in very close association on steeply sloping to rolling topography in Day County. Buse loam comprises approximately 75 percent of this association with Barnes making up the remaining 25 percent. Nearly 41,600 acres of this association, comprising about 6.4 percent of the county, have been separated out.

Soil Profile. The soil profiles of the Buse and Barnes soils in this association are identical with those discussed under the respective soil series on pages 34 and 15 of this report.

Use and Management. Even though approximately one-fourth of the area in this association is comprised of Barnes loam, the recommended use and management of these soils is the same as that discussed under the Buse loam on page 34.

Exline Complex (11)

Exline has developed in sediments laid down in comparatively quiet slack water areas in the Lake Dakota Basin. The Exline in Day County consists of a complex of soils with different degrees of clay pan development in the subsoil and with different surface textures. This Exline complex includes soils of which about 20 percent have little or no clay pan development, 30 percent have a moderately developed clay pan, and 50 percent have extremely heavy clay pan subsoil. The clay pan in this soil may occur at or near the surface, or a foot or more below the surface.[4] Some 1,920 acres of this complex have been separated in Day County.

Soil Profile. The surface soil of a typical Exline varies from 5 to 10 inches in thickness. The upper portion of this surface soil is a black, friable silt loam. The lower part of the surface soil consists of a thin layer commonly not over 2 inches in thickness, which is dark gray in color. The subsoil below is a compact, heavy clay pan 10 to 14 inches thick. The dark grayish-brown silty clay upper subsoil grades into a grayish-brown silty clay loam with depth. The substratum is a dark olive-brown silty clay loam with spots and streaks of free lime and salt crystals.

Use and Management. Exline complex is being cultivated in some areas, but it requires considerable power to work and crop yields are generally low. Both surface and internal drainage are poor. Crops suffer from excess moisture in wet seasons and from drought in dry seasons. Small circular spots, where the clay pan subsoil has been exposed, give this soil a scabby appearance. Probably the best use for this soil is for hay land or for pasture.

Wind erosion has been quite severe where attempts to cultivate this soil have been made.

Fargo Silty Clay Loam, Saline Phase (12)

Fargo silty clay loam is a poorly drained soil occupying long narrow depressions or old drainage troughs.

[4]Clay pan development in this soil is the result of a combination of restricted internal drainage and a high soluble salt content.

The soil profile has developed in heavy clayey sediments laid down by water. Only 2,886 acres of Fargo silty clay loam have been mapped in the county.

Soil Profile. The surface soil is a black, heavy silty clay loam 8 to 14 inches deep. It may or may not contain free lime. The subsoil is very dark gray to grayish-brown in color. This horizon ranges from 12 to 18 inches in thickness, is a heavy silty clay, and contains free lime. The parent material below is a very dark gray, calcareous, heavy silty clay.

Use and Management. Fargo soils vary widely in their use and management depending a great deal on whether or not they have been adequately drained. Where good drainage has been established, Fargo soil produces moderate yields of small grains and forages. Early frosts limit the production of corn. Where drainage has not been established, native water-loving grasses provide fair yields of forage. In wet years, yields on both the drained and undrained Fargo soils may be reduced somewhat, due to excess moisture.

Erosion is seldom a problem on this soil. When fields are left without a vegetative cover, in the better drained areas, wind erosion does remove some of the surface soil.

Foxhome Sandy Loam (16)

Foxhome sandy loam has developed in gravelly and stony water-washed glacial till. It occupies nearly level topography around and between some of the lakes in Day County. Only a small percent of the county, or 8,320 acres of this soil, has been mapped.

Soil Profile. The surface soil ranges from 4 to 6 inches in depth, is very dark brown in color and is a calcareous sandy loam. Stones are often quite numerous on the surface. The subsoil is a gravelly, sandy loam, dark grayish-brown in color and 4 to 5 inches in thickness. The substratum is a grayish-brown clay loam or gravelly clay loam with spots and streaks of free lime in the upper portion.

Use and Management. Since these areas are periodically flooded, they are used almost entirely for native hay and permanent pasture. Small scattered patches with little or no vegetative cover indicate where the soluble salt content is very high and close to the surface of the soil profile.

There is little or no erosion on these soils except that caused by streams cutting new channels during flood stage in lower areas.

Maple Silty Clay Loam (21)

This soil has developed in water-laid sediments which have a very high soluble salt content. It occurs on flat depressional areas in the Lake Dakota Basin and around the edges of some of the larger lakes in the county. A relatively small percent, or 13,472 acres of this soil type, exists in the county.

Soil Profile. The surface soil is a black silty clay loam ranging from 6 to 10 inches in thickness. The subsoil is 8 to 12 inches thick, gray in color and high in salts. Below this a light gray silty clay loam parent material is found. Free lime and other salts are abundant from the surface

on down in this profile. Scattered white alkali or salt patches occur on the surface of this soil when it dries out.

Use and Management. Maple silty clay loam is used almost entirely for the production of native hay and pasture. The high soluble salt content and the poor drainage of this soil restrict its use. Production of small grains and corn is not profitable due to the above restrictions.

Erosion is not a problem on this soil.

Parnell Silt Loam, Poorly Drained (25)

Parnell silt loam, poorly drained, has developed in sediments washed down from the surrounding slopes and redeposited in upland depressions. There are many large areas of this soil in Day County, but the major portion of this soil occurs in thousands of small depressions scattered throughout the county east of the Bristol Moraine. There are about 11,620 acres of this soil in the county.

Soil Profile. The topsoil of Parnell silt loam, poorly drained, is black in color and 8 to 16 inches thick. Beneath this is a dark gray subsoil 6 to 12 inches thick, with rust-brown iron stains. This layer may also contain free lime. The underlying material consists of a gray to light olive-gray clay loam glacial till, with many streaks and spots of gray, yellow and brown scattered throughout.

Use and Management. Parnell silt loam is one of the most difficult soils to handle in the county. In the spring it is flooded. It dries out very slowly and may flood again in any season. Even when drained, crops may be flooded out in the wetter years. Normally, these depressions have been cultivated two or three years out of five. Besides being difficult to cultivate, these depressions restrict or hinder cultivation of the better soil types surrounding them. Where drainage has not been established, these depressions may be best suited for the production of forages. Where adequate drainage has been established, this soil produces fair to good yields of cultivated crops.

This soil does not have any serious erosion problems. Instead, several inches of sediments, washed down from surrounding higher areas, frequently have been added to the surface.

Sioux-Fordville Complex, Gravelly Sandy Loams and Sandy Loams (31)

In areas where the depth to sands and gravels varied considerably, but were dominantly less than 15 inches, a Sioux-Fordville complex was mapped. Sioux, which is the shallower member, dominates this complex. Nearly 2,170 acres of this complex have been separated in Day County.

Soil Profile. Neither the Sioux nor Fordville profiles in this complex differ from those described under their respective types on pages 32 and 25.

Use and Management. This complex is both droughty and subject to severe wind erosion. Areas under cultivation are generally in close as-

sociation with better soils. Normally cultivation is not practical except for the production of forages for livestock. Yields of forage crops are generally quite low.

Wind erosion has been very severe in some areas. Protection of the relatively thin surface soil is essential if forage production is to be maintained on this complex.

Sioux Gravelly Sandy Loam (32)

This soil includes old lake shore or beach deposits around some of the larger lakes in the eastern part of Day County. A comparatively small percent of the county, or 5,184 acres of this soil, has been separated.

Soil Profile. The entire profile of this separation varies from one place to another. Usually the surface soil is a dark grayish-brown, gravelly sandy loam. The subsoil consists of layers of sands and gravels with thin beds of clay and silt. Drainage may vary from excessive, away from the lake, to very poor near the lake. The parent material is similar to that found in the subsoil, but generally it contains more silts and clays.

Use and Management. Some areas of this soil have been cultivated in the past, but crop failures and wind erosion have discourged cultivation. Much of this soil is water-logged when the water table is high, and very droughty when the water table receeds. Native grasses produce poor to fair stands of forage for livestock consumption.

Sioux Loam (33)

Sioux loam is a shallow soil developed over sands and gravels. It occurs in close association with the deeper Fordville soils on stream terraces and on outwash flats. In Day County much of the Sioux loam has been mapped in an association with Fordville soils. Some 5,760 acres of Sioux loam have been separated from other soils and associations.

Soil Profile. The surface soil of Sioux loam is characterized by a very dark brown loam, 6 to 10 inches thick. This is underlain by a 6- to 12-inch layer of dark brown gravelly loam subsoil. At less than 18 inches below the surface, dark grayish-brown sands and gravels are encountered. This substratum is very loose and porous. Free lime is present in the substratum.

Use and Management. Areas of Sioux under cultivation are generally in close association with better soils such as Fordville. The shallow depth and excessive drainage of the Sioux soil make it extremely droughty during seasons of low rainfall. It may be best used for the production of forages for livestock. Yields of forage crops are comparatively low.

Water and wind erosion have resulted in the loss of topsoil from Sioux loam. On the sloping areas both sheet and gully erosion have occurred where the land was left without a vegetative cover.

Sioux Sandy Loam (34)

Sioux sandy loam also occurs in close association with the Fordville soils. Only a small percent, or 5,568 acres, has been separated from soil associations in Day County.

Soil Profile. The soil profile, although more sandy, is essentially

the same as that of Sioux loam already described.

Use and Management. Sioux sandy loam is generally even more droughty than Sioux loam. Cultivated crops are seldom grown and usually result in crop failures. Tame grasses and legumes for forage production do best on this soil. Yields are low.

Wind erosion is a serious hazard on this sandy soil. Care must be taken to keep a crop cover or crop residue on the surface as much of the time as possible.

Tetonka Silt Loam, Poorly Drained (35)

This soil has developed in silty sediments in depressions west of the Bristol Moraine. These depressional areas in the Lake Dakota Basin have no natural surface drainage outlets. Although a few large areas of this soil occur in Day County, the major portion occurs in hundreds of small depressions scattered throughout the lake plain. This poorly drained depressional soil accounts for about 7,140 acres in the county.

Soil Profile. The surface soil of Tetonka silt loam, poorly drained, is 8 to 14 inches thick and very dark gray to black in color. This grades into a light gray, very soft floury layer ranging from 4 to 12 inches in thickness. Spots and streaks of gray and rust-brown iron stains are present in this layer. The subsoil is a heavier textured silty clay loam, which is dark brown to nearly black in color and 10 to 30 inches in thickness. This is underlain by a yellowish-brown to olive-brown substratum. Free lime or calcium carbonate is present in this underlying material

Use and Management. In Day County this soil is one of the most difficult to handle. In the spring it is frequently flooded. It dries out slowly and many of these depressions may flood again in any season. Cultivation is difficult unless drainage is established. Even when drained, crops may be flooded out in the wetter years. When adequately drained this soil produces moderate to good yields of all crops common to the area. Besides being difficult to cultivate, these depressions restrict or hinder cultivation of the better soil types surrounding them. Where several depressions exist in a single field, it is often necessary to detour around them in order to cultivate the better soils. These depressions may be best suited for the production of forages. In wet years, sedges and water-loving grasses may crowd out the more desirable varieties of grasses.

Erosion is not a problem on these soils. Many of these soils have had several inches of accumulation added to their surface soil from sediments washed down from the surrounding higher areas and redeposited in the depressions.

FOURTH CLASS SOILS

(Non-tillable Land—Wet, Stony, or Hilly)

The soils in this class are non-tillable because of poor drainage, droughtiness, excessive stoniness or steepness of slope. They are best suited for controlled grazing of livestock, for wild life refuges, and for

the production of perennial grasses and legumes for forage.

Barnes Stony Loam (5)

Barnes stony loam occurs in small patches scattered throughout the county on the more undulating upland. The total area of this soil in the county is approximately 2,790 acres.

Soil Profile. The soil profile is essentially the same as that of Barnes loam discussed on page 15, under First Class Soils. However, more stones are present both on the surface and in the profile of Barnes stony loam.

Use and Management. Because of the abundance of stones, this soil is used mainly for pasture. It is seldom economical to improve it for tillage by removing the stones.

Since this soil is usually left in native grass, erosion is rarely a problem. Over-grazing on some of the steeper slopes has weakened the grass stand so that some gully erosion has occurred. Controlled grazing of livestock on the steeper slopes will help control water erosion.

Buse Loam

Steeply sloping to roughly broken valley sides and shallow glacial till soils on the uplands are included under Buse loam. The most pronounced areas of Buse loam occur in the northeast corner of Day County and on the Bristol Moraine in western part. All of the Buse loam in the county has been mapped in close association with the Barnes soil. No acreage of Buse loam has been separated from the association in which it occurs.

Soil Profile. The surface soil of Buse loam consists of a very dark brown, calcareous loam 4 to 6 inches thick. Below this is a thin transition layer which changes in color downward from a dark grayish-brown to an olive-brown. This transition layer or subsoil is normally about 4 inches in thickness. A light olive-brown, highly calcareous clay loam glacial till underlies the subsoil.

Use and Management. Cultivation is not practical on Buse loam. The steep slopes are hard to work with farm machinery. Then too, this soil is very thin and susceptible to both sheet and gully erosion. A vegetative crop cover must be maintained on these soils as much of the time as possible if they are to be protected against further loss of soil. The recommended use for Buse loam is for moderately restricted grazing land or hay land.

Buse Stony Loam (9)

Buse stony loam occurs in close association with Buse loam on steeply sloping topography. This soil type accounts for about 5,440 acres in the county.

Soil Profile. The soil profile of Buse stony loam, although much more stony, is essentially the same as that of the Buse loam discussed in the preceeding paragraphs.

Use and Management. In addition to being thin and on hilly topography, Buse stony loam has many stones throughout the profile. Cultivation is not at all practical. Native grasses produce only fair pasture for livestock on this soil.

Parnell Silty Clay Loam, Very Poorly Drained (26)

This very poorly drained soil occurs in thousands of depressions scattered throughout the county east of the Bristol Moraine. This is the most poorly drained soil of the uplands and occupies depressional areas which have no natural outlets. They are flooded during the greater part of the growing season in years of average rainfall. Generally, they are not cultivated except in very dry years. These very poorly drained soils account for about 7.2 percent, or 46,664 acres, in the county.

Soil Profile. The topsoil of Parnell silty clay loam is 10 to 16 inches thick and black in color. Below this lies a dark gray subsoil, 8 to 12 inches thick, with many spots and streaks of gray, yellow, and rust-brown iron stains. Free lime is also present in the subsoil. The underlying material consists of a gray to light olive-gray clay loam glacial till.

Use and Management. Cultivation of this soil is seldom possible. Even when drained, the tight subsoil and flood hazard makes them relatively poor soils. The recommended use for these depressions is for pasture and hay land in years of average or below normal precipitation and for wildlife in the wetter years. In wet years, sedges and rushes may crowd out the better grasses.

Pierce Gravelly Sandy Loam (27)

Pierce soils occur in close association with the Buse soils on hilly topography. They differ from the Buse soils in having a coarser textured subsoil and substratum. Knobs and stringers of gravelly and stony material are included under Pierce gravelly sandy loam. Approximately 15,260 acres of this soil type have been mapped in the county.

Soil Profile. The surface soil consists of 2 or 3 inches of very dark brown, gravelly, sandy loam. Just below this is another very thin layer of dark brown gravelly sand. A loose, coarse, sandy gravel substratum occurs at a depth of 5 or 6 inches below the surface.

Use and Management. Pierce soils are very thin and droughty. They are not suited for any kind of cultivation. Even the production of forages for livestock grazing is poor.

Rauville Silty Clay Loam (28)

Rauville silty clay loam is a first bottom, or flood plain, soil. It is the wettest soil on the stream bottom and occurs in positions lower than the Lamoure silty clay loam. Rauville is wet in the spring and early summer, and the water table remains at or near the surface throughout the year. The soil has developed from calcareous, fine-textured materials over sandy, gravelly, silty or clayey stratified layers of water-washed sediments. About 1,280 acres of Rauville have been mapped in Day County.

Soil Profile. The surface soil of Rauville is 8 to 12 inches deep and is black in color. This silty clay loam surface may have free lime present. The subsoil ranges in depth from 12 to 30 inches and grades from a dark gray, massive, silty clay loam to a massive, silty clay or clay loam with

depth. Stratified or water-laid sands, gravels and clays underlie the subsoil.

Use and Management. The poorly drained condition of this soil and frequent flooding make it unsuitable for cultivation. Even its use for pasture and hay land is limited. In wet seasons it may flood and drown out the better grasses. Fair production of native forages may be obtained in years with below average precipitation.

Tetonka Silt Loam, Very Poorly Drained (36)

This very poorly drained soil has developed in silty water-laid sediments in depressions west of the Bristol Moraine in the Lake Dakota Basin. Several hundred of these very poorly drained depressions have been separated on the map. They account for about 4,800 acres, or 0.8 percent, of the total area in the county.

Soil Profile. The surface soil of this very poorly drained soil is 6 to 12 inches thick, black in color and very friable. A light gray, very soft floury layer, 4 to 16 inches in thickness, lies immediately below the surface soil. This light gray layer is mottled or spotted with many gray, yellow and rust-brown iron stains. These mottles indicate that this soil is very poorly drained. The subsoil is a compact, heavy-textured, dark brown to nearly black layer, 10 to 30 inches in thickness. A grayish-brown to olive-brown substratum is found below.

Use and Management. These very poorly drained depressions in the Lake Dakota Basin are rarely cultivated. Even when surface drainage is provided, crops are often flooded out. These depressions, like the very poorly drained depressions found on the uplands, may be best utilized for forage production. In wet years, sedges and rushes may crowd out the better grasses.

Productivity of Soils in Day County

The estimated average acre yields of all the major crops grown on the different soils of Day County are shown in Tables 1, 2 and 3.

In the columns under average management are listed the yields which may be expected under the management practices most commonly followed in the county. Common management practices generally followed by most farmers in the county include the return of manure to the land, incorporation of grain stubble and other crop residues with the soil, application of small amounts of commercial fertilizers, some diversification of close growing crops with intertilled crops and the use of some erosion control practices.

In the footnotes at the bottom of the tables are listed the yields which may be expected as a result of better farming methods and improved management. Better farming methods include proper crop rotations,

improved crop varieties, application of commercial fertilizers where needed, weed control, good soil management, maintenance of organic matter through the use of crop residue, green manure and barnyard manure.

The estimated crop yields listed under average management in Tables 1, 2 and 3 are based on county wide yields, taken from the South Dakota Crop and Livestock Reporting Service and on observations of local and state agricultural authori-

Table 1. Estimated Yields of Major Grain Crops on the Soils of Day County, South Dakota*

Soil Types	Crops and Estimated Yields Per Acre†					
	Corn Average Management	Wheat Average Management	Oats Average Management	Barley Average Management	Rye Average Management	Flax Average Management
	Bushels	Bushels	Bushels	Bushels	Bushels	Bushels
Aastad silt loam	23	14	35	26	15	9.0
Aberdeen complex	16	8	25	17	12	6.0
Barnes loam	19	12	29	20	13	8.0
Barnes stony loam	—‡	—	—	—	—	—
Beadle silt loam	16	9	25	17	12	7.0
Beotia silt loam	24	13	32	24	15	8.5
Beotia silt loam, moderately deep over till	23	13	32	22	14	8.0
Buse loam	—	—	—	—	—	—
Buse stony loam	—	—	—	—	—	—
Egeland loam and sandy loam	24	9	28	18	11	7.0
Exline complex	12	6	18	14	7	4.0
Fargo silty clay loam, saline phase	10	5	14	12	5	5.0
Fordville fine sandy loam	18	7	19	14	9	5.0
Fordville loam	22	8	28	20	12	7.0
Foxhome sandy loam	10	—	—	—	6	5.0
Great Bend silt loam, moderately deep over till	22	12	30	20	14	8.0
Kranzburg silt loam	25	14	34	25	14	10.0
Lamoure silt loam, slightly saline	24	12	35	20	—	—
Lamoure silty clay loam, moderately saline	—	—	—	—	—	—
Maple silty clay loam	—	—	—	—	—	—
Nutley silty clay	14	8	23	16	9	6.0
Nutley silty clay loam	18	9	25	20	10	7.0
Parnell silt loam, poorly drained§	14	6	20	16	—	3.0
Parnell silty clay loam, very poorly drained	—	—	—	—	—	—
Pierce gravelly sandy loam	—	—	—	—	—	—
Rauville silty clay loam	—	—	—	—	—	—
Sinai silt loam	26	13	35	26	13	9.5
Sinai silty clay loam	22	13	33	24	13	9.0
Sioux gravelly sandy loam	—	—	—	—	3	2.0
Sioux loam	10	—	—	—	5	4.0
Sioux sandy loam	8	—	—	—	4	3.0
Tetonka silt loam, poorly drained§	14	7	20	16	—	4.0
Tetonka silt loam, very poorly drained	—	—	—	—	—	—
Tolley loam	20	11	27	18	12	8.0
Waubay silt loam	28	15	36	28	16	10.5

*Estimated yield data in this report refer only to years of average or near average annual precipitation and will not hold true for periods of prolonged drought, such as the drought years of the 30's.

†With improved management, farmers on the better soils can expect increased crop yields of: 6 to 10 bushels of corn, 4 to 6 bushels of wheat, 10 to 24 bushels of oats, 6 to 10 bushels of barley, 6 to 12 bushels of rye, and 2 to 4 bushels of flax per acre.

‡Indicates that the crop is not adapted, or is rarely grown.

§Improved management in the case of poorly drained soils includes adequate water management.

ties and other persons familiar with the area. Comparison of yields was also made between the soils of Day County and the same soils found in other areas for which experimental data were available. The estimates for yields under improved management given in the footnotes at the bottom of the tables were based partly on experimental data obtained from the Agricultural Experiment Station at South Dakota State College. The experimental test plots in Day County provided some of the experimental data used in estimating yields under improved manage-

Table 2. Estimated Yields of Hay on the Soils of Day County, South Dakota*

Soil Types	Estimated Hay Yields in Tons per Acre†			
	Alfalfa Brome Average Management	Alfalfa Average Management	Tame grasses‡ Average Management	Native grasses Average Management
	Tons	Tons	Tons	Tons
Aastad silt loam	2.3	2.0	1.5	0.8
Aberdeen silt loam	1.8	1.5	1.0	0.6
Barnes loam	2.0	1.7	1.2	0.7
Barnes stony loam	§	----	----	0.6
Beadle silt loam	1.8	1.4	1.0	0.6
Beotia silt loam	2.2	2.0	1.4	0.8
Beotia silt loam, moderately deep over till	2.1	1.9	1.4	0.8
Buse loam	1.0	1.0	0.7	0.4
Buse stony loam	----	----	----	0.4
Egeland loam and sandy loam	1.9	1.7	1.1	0.6
Exline complex	1.6	1.4	0.8	0.5
Fargo silty clay loam, saline phase	1.5	1.4	1.0	0.7
Fordville fine sandy loam	1.7	1.6	0.9	0.5
Fordville loam	1.9	1.7	1.0	0.6
Foxhome sandy loam	1.5	1.4	0.7	0.4
Great Bend silt loam, moderately deep over till	2.0	1.8	1.2	0.7
Kranzburg silt loam	2.2	2.0	1.4	0.8
Lamoure silt loam, slightly saline	2.5	2.2	1.6	1.2
Lamoure silty clay loam, moderately saline	----	----	1.2	0.6
Maple silty clay loam	----	----	1.0	0.5
Nutley silty clay	1.6	1.5	0.8	0.5
Nutley silty clay loam	1.8	1.6	1.1	0.6
Parnell silt loam, poorly drained	----	----	1.5	0.9
Parnell silty clay loam, very poorly drained	----	----	1.0	0.5
Pierce gravelly sandy loam	0.7	0.6	0.4	0.3
Rauville silty clay loam	----	----	----	0.5
Sinai silt loam	2.3	2.0	1.5	0.9
Sinai silty clay loam	2.2	2.0	1.4	0.8
Sioux gravelly sandy loam	0.8	0.8	0.5	0.3
Sioux loam	1.2	1.0	0.6	0.4
Sioux sandy loam	1.0	0.9	0.5	0.4
Tetonka silt loam, poorly drained	----	----	1.6	1.0
Tetonka silt loam, very poorly drained	----	----	1.0	0.6
Tolley loam	1.9	1.7	1.1	0.7
Waubay silt loam	2.5	2.2	1.5	1.0

*Estimated yield data in this report refer only to years of average or near average annual precipitation and will not hold true for periods of prolonged drought, such as the drought years of the 30's.

†With improved management farms on the better soils can expect increased hay yields of: one-half to one ton of alfalfa, three-fourths to one ton of alfalfa-brome, one-fourth to one-half of tame grasses, and one-fourth ton of native grasses.

‡Tame grasses recommended for Day County include bromegrass, crested wheatgrass, and Ree wheatgrass and Reeds canary grass in the depressions.

§Indicates the crop is not adapted or is rarely grown.

ment. Determinations of yields on different soils under improved management were based on field observations and estimates by soil scientists and other soil and crop men.

If a farmer's yields are equal to or below the yields given in the tables under average management practices, it will pay him to examine his management practices to see where he can improve them and increase his yields. Even in those cases where

Table 3. Estimated Pasture Yields on the Soils of Day County, South Dakota*

Soil Types	Estimated Pasture Yields in Animal Unit Month†		
	Improved Management		
	Alfalfa or sweet clover-tame grass Rotational Grazing	Tame grass‡ Rotational Grazing	Native grasses Unimproved Management Permanent Pasture
	A.U.M.†	A.U.M.	A.U.M.
Aastad silt loam	2.6	1.7	1.2
Aberdeen silt loam	2.0	1.2	0.8
Barnes loam	2.5	1.6	1.0
Barnes stony loam	----	----	0.8
Beadle silt loam	2.0	1.4	0.9
Beotia silt loam	2.6	1.7	1.1
Beotia silt loam, moderately deep over till	2.6	1.7	1.1
Buse loam	1.3	0.8	0.6
Buse stony loam	----	----	0.5
Egeland loam and sandy loam	2.3	1.4	0.9
Exline complex	1.8	0.9	0.6
Fargo silty clay loam, saline phase	1.7	1.3	1.0
Fordville fine sandy loam	2.2	1.2	0.9
Fordville loam	2.3	1.3	0.8
Foxhome sandy loam	1.5	0.8	0.5
Great Bend silt loam, moderately deep over till	2.4	1.4	0.9
Kranzburg silt loam	2.6	1.7	1.2
Lamoure silt loam, slightly saline	2.7	1.8	1.6
Lamoure silty clay loam, moderately saline	----	1.0	0.7
Maple silty clay loam	----	0.8	0.6
Nutley silty clay	1.8	1.3	0.7
Nutley silty clay loam	2.1	1.4	0.9
Parnell silt loam, poorly drained	----	1.7	1.3
Parnell silty clay loam, very poorly drained	----	0.9	0.5
Pierce gravelly sandy loam	0.7	0.4	0.3
Rauville silty clay loam	----	----	0.4
Sinai silt loam	2.6	1.7	1.2
Sinai silty clay loam	2.6	1.7	1.2
Sioux gravelly sandy loam	0.8	0.5	0.3
Sioux loam	1.1	0.7	0.4
Sioux sandy loam	0.9	0.6	0.3
Tetonka silt loam, poorly drained	----	1.7	1.3
Tetonka silt loam, very poorly drained	----	1.0	0.5
Tolley loam	2.4	1.4	0.9
Waubay silt loam	2.7	1.8	1.4

*Estimated yield data in this report refer only to years of average or near average annual precipitation and will not hold true for periods of prolonged drought, such as the drought years of the 30's.

†A.U.M.—Animal Unit Months: The number of months one acre will support one cow (beef) during the grazing season: The number of acres required to supply seasonal pasture for one animal unit on a particular soil type may be secured by dividing the A.U.M. figures given in the table above into the number 5. This is based on a 5-month grazing season.

‡Tame grasses recommended for Day County include bromegrass, crested wheatgrass, and Ree wheatgrass and Reed canary grass in the depressions.

the present crop yields are higher than those listed under average management, it will pay the farmer to use better management practices. On most soils, crop yields can be increased and will more than pay for the cost of the improvements.

The figures given in the productivity tables may change in the future. Factors such as new crop varieties, new and better cultural and fertility practices, may cause increases in any of the crops listed in the tables. On the other hand, new plant diseases, insect pests and the like may cause decreases in crop production. Farmers in Day County should keep this in mind when comparing their respective yields with those given in the tables when new factors occur which affect productivity.

How to Maintain the Soils and Increase Crop Yields in Day County

Satisfactory crop yields year after year are the result of good soil, good management and favorable weather conditions. Poor yields may be caused by a poor soil, by poor management, or by trying to grow crops that are not adapted to the area. Tables 1, 2 and 3 on pages 37, 38 and 39 present estimated crop yields over a period of years on the various soils of Day County.

Good soil management refers to such practices as a wise selection of adapted crop varieties, selection of a grass and legume rotation, application of fertilizers where needed, utilization of manure and crop residues, use of proper tillage practices, and effective weed and erosion control.

A good crop rotation is the foundation of any good soil management program. A rotation which includes grasses and legumes should be used. The grasses and legumes will aid in supplying organic matter and nitrogen to the soil, both of which are needed in order to obtain vigorous crop growth and good yields. To be most beneficial, all legumes should be inoculated at time of seeding. Inoculation will help to improve the stand, increase the nitrogen fixation in the soil, and promote better growth. A deep-rooted legume such as sweet clover or alfalfa will also make it possible to maintain better physical conditions in the lower horizons of the soil as well as in the surface. Crop rotations will also help provide a balance between the soil depleting crops, such as corn and small grains, and soil conserving crops such as legumes and grass mixtures. See Table 4 for suggested crop rotations.

Just as soils differ as to the crop yields they will produce, so will crop varieties vary as to their ability to produce. Farmers in Day County will do better with adapted crop varieties for their particular area. Yields of adapted varieties of hybrid corn versus open-pollinated are an example. The Agricultural Extension Agent in the county can

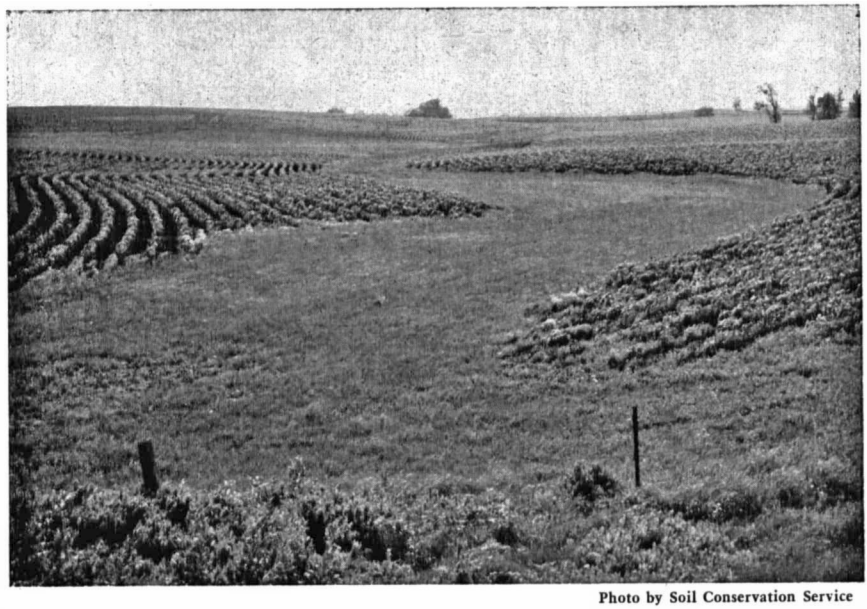


Photo by Soil Conservation Service

Grass waterways and contour cultivation are important practices on the more undulating topography in Day County

supply the necessary information as to what crop varieties are best adapted to this area.

Soil tests are a valuable aid in determining what a soil needs in the form of plant food. Some soils in Day County need commercial fertilizers while others may not. Soil tests and field trials together with the soil map will help farmers decide where application of fertilizers should be made and in what amounts. The use of fertilizers will increase the yields of crops, improve their quality and hasten maturity in many cases. Increased response to commercial fertilizers is a sure sign that plant nutrients are needed.

Barnyard manure is another valuable source of plant nutrients and organic matter. Maximum benefits may be obtained by spreading it on the corn land when corn occurs in the rotation. Returning barnyard manure and crop residues to the soil, and the plowing under of sweet clover or alfalfa and grasses, are highly desirable practices. They aid in maintaining the fertility and organic matter content of the soil.

Good tillage practices help to incorporate crop residue and manure into the soil. They encourage soil aeration and provide the satisfactory seed beds so essential for the establishment of good crop stands. Proper tillage protects the soil against erosion, helps to keep the soil in good physical condition and aids in conserving moisture, chiefly by controlling weeds. To produce maximum crop yields, soils must be kept in good physical condition.

Soils should be tilled only when

Table 4. Suggested Crop Rotations and Fertilizer Applications for the Soils of Day County, South Dakota

Names of Soil Groups and Soils*	Rotation	Corn	Oats, Barley, Wheat	Rye	Alfalfa and Clovers	Tame Grasses
First Class Soils Barnes and Aastad loams Barnes loam Beotia silt loam Egeland loam and sandy loam Fordville loam Great Bend and Beotia silt loam, moderately deep over till Kranzburg silt loam Nutley silty clay loam Sinai silty clay loam Sinai and Waubay silt loams and Barnes loam Tolley loam	Alf-Alf-Corn-Sm. Grain Corn-Sm. Grain† Alf.Br.-2 to 4 years§ Corn-Sm. Grain-Sm. Grain Corn-Sm. Grain or Corn-Sm. Grain-Sm.¶ Grain + Sw. Cl.-Sw. Cl. or Corn-Sm. Grain + Sw. Cl. Plow Sw. Cl. under in spring or Sm. Grain-Corn-Sm. Grain + Sw. Cl.-Sw. Cl.-Sm. Grain or Corn	10 tons barnyard manure per acre or 100 lbs. 0-43-0 plowed under when corn follows alfalfa or clovers	Add 100 lbs. 16-20-0 with the drill at time of planting or when barnyard manure has been applied additional phosphate is recommended	Top dress in spring with 100 lbs. 33-0-0 (Ammonium nitrate)	Add 100 lbs.‡ 0-43-0 with drill at time of planting	Add 100 lbs. of 33-0-0 after stand is established
Second Class Soils Aberdeen complex Beadle silt loam Nutley silty clay Nutley silty clay loam and Buse loam	Alf. Br.-3 to 5 years‖ Corn-Sm. Grain-Sm. Grain or Sm. Grain-Corn-Sm. Grain + Sw. Cl.-Sw. Cl.-Sm. Grain or row crop or Sm. Grain-Corn-Sm. Grain + Sw. Cl.-Sw. Cl.	10 tons barnyard manure per acre	Same as above	Same as above	Same as above	Same as above
Fordville and Sioux loams and sandy loams Fordville fine sandy loam	Alf. Br. 2-4 years Corn-Sm. Grain-Corn-Sm. Grain or Corn-Sm. Grain + Sw. Cl. Sw. Cl.-Corn-Sm. Grain	10 tons barnyard manure per acre	Same as above	Same as above	Same as above	Same as above
Lamoure silt loam, slightly saline	Alf. Br. 2-4 years Corn-Sm. Grain-Corn-Sm. Grain					

Names of Soil Groups and Soils*	Rotation	Corn	Oats, Barley, Wheat	Rye	Alfalfa and Clovers	Tame Grasses
Third Class Soils Barnes loam and Pierce gravelly sandy loam Buse and Barnes loam Foxhome sandy loam Sioux and Fordville gravelly sandy loams and sandy loams Sioux gravelly sandy loam Sioux loam Sioux sandy loam	Sm. grain or flax seeded down to grass-legume mixture-tame hay or pasture 3-4 years				Same as above	
Exline complex	Sm. grain or flax seeded down to grass-legume mixture Leave in tame hay or pasture as long as possible		10 tons barnyard manure plowed under	Top dress in spring with 100 lbs. 33-0-0 (Ammonium nitrate)	Add 100 lbs. 0-43-0 with drill at time of planting	
Fargo silty clay loam, saline phase Lamoure silty clay loam, moderately saline Maple silty clay loam Parnell silt loam, poorly drained Tetonka silt loam, poorly drained	Permanent tame hay or pasture		Trial application of 100 lbs. 0-43-0 with drill at time of planting, if drainage is established or if cultivated			
Fourth Class Soils Barnes stony loam Buse stony loam Pierce gravelly sandy loam	Permanent tame hay or pasture or permanent native hay or pasture					
Parnell silty clay loam, very poorly drained Rauville silty clay loam Tetonka silt loam, very poorly drained	Permanent native pasture or Seed to Reed canary grass					

*Since some of the soils in the county occur in such close association that it would be impossible to separate and treat each soil individually, many of the recommendations in the table above have been made for soil associations.
†Key to abbreviations. Alf.=Alfalfa; Sm. Grains=Small Grains; Br.=Brome; Sw. Cl.=Sweet Clover.
‡The suggested application of 0-43-0 may be applied to established stands of alfalfa as a top dressing.
§Ree wheatgrass or Crested wheatgrass may be substituted in rotations in place of Bromegrass, if desired.
¶Other clover may be substituted for sweet clover in the rotations. Clovers refer mainly to sweet and red clover for forage, pasture, green manure, and seed.
‖Sorghum may be substituted in the rotation in place of corn.

the amount of moisture in the surface and subsoil is right for good tillage. Finer textured soils, such as silty clays and clays, are likely to puddle if plowed when wet. Coarser textured soils like sandy loams are subject to wind erosion when worked during dry weather. Coarser textured soils, particularly those which are more subject to wind erosion, should be left with a rough surface or with a protective covering of crop residue when tilled. Weeds compete with crops for moisture, plant nutrients and space. Good tillage practices and a good crop rotation will help control many of the common weeds. (It may be necessary in some cases to use commercial weed eradication sprays for best results).

Protecting Soils Against Erosion

Good soil management must also include protection against erosion. Erosion control practices help maintain yields and reduce wind and water erosion to a minimum. Water control practices are needed in some areas of the county. Other areas are so hilly or steep that seeding to permanent hay or pasture is the only means of erosion control. Wind erosion has been very detrimental on some soils in the county.

One of the principal aids in erosion control is the selection of a crop rotation which includes hay and pasture for one to four years or more. A rotation of this kind will aid in maintaining the soil organic matter and fertility, so that it will hold water and support vigorous soil binding crops. Reducing the number of years of row crops on the more sloping land will also aid in stopping erosion. Other soil conserving practices, such as using crop residues and fertilizers, and protecting the soil with a vegetative covering as much of the time as practicable, will help to give satisfactory erosion control.

Additional practices such as grass waterways, strip cropping, terracing on sloping land, cultivation on the contour, plowing in the spring rather than in the fall, will be needed on some soil types to control water erosion. The same basic principles will apply in helping control wind erosion. Maintenance of a vegetative cover, leaving crop residues on the surface, use of field strip cropping, establishing shelter belts or wind breaks and leaving a rough surface on the soil are some of the major control practices.

Day County and Its Farms

Day County is rectangular in shape except for a small area cut out of the northeast corner. It is 37 miles in length from east to west, and 30 miles in width from north to south. It includes 29 townships and has a total area of approximately 1,013 square miles or 648,792 acres. This includes the Sisseton Wahpeton Indian Reservation in the eastern part,

and the Waubay Migratory Waterfowl Refuge in the northeastern part of the county.

Day County is an area of lakes, hills and rolling plains. The total area in lakes, large and small, is greater than any other county in South Dakota. Waubay, Pickerel, Spring, Millerbrands, Enemy Swim, Rush, Blue Dog and Bitter Lake are some of the larger lakes found in the eastern part. Other smaller lakes, including a few artificial lakes, are found scattered throughout. Antelope Creek, Mud Creek and Pickerel Creek are the only large streams which occur in the western part of the county and flow west to the James River. Drainage for the rest of the county is provided by the many chains of lakes, marshes and kettleholes which take care of the run-off waters.

Day County may be divided into two distinct topographic sections by a range of hills called the Bristol Moraine. That area west of an imaginary line passing through Crandall, then north and east to the west edge of Independence Township, lies in the James River Valley. The land surface in this area varies from nearly level to gently undulating. East of this line the area is referred to as the Prairie Coteau or Coteau Hills. The topography varies from steeply sloping, in the Bristol Moraine, to undulating or rolling over the remainder. Several areas of nearly level topography occur in Troy, Rusk, and Egeland townships and around the lakes in the eastern part of the county. Fig. 6 shows a block diagram of the landscape in Day County. That portion of the county to the west of the Bristol Moraine is called the Prairie Plains of the James River Valley.

Climate of Day County

The sub-humid climate of Day County is typical of the Northern Great Plains. Wide variations in temperatures exist between winter and summer. The summers are hot and dry, while the winters are very cold for short periods of time. Snow covers the ground throughout most winters. A 38-year record taken near Webster indicates the average date of the last killing frost in the spring is about May 16, and the first killing frost in the fall is about September 25 or an average frost-free growing season of 132 days. The highest temperature recorded near Webster during the 38-year period was 108° F. and the lowest was –44° F. The average July temperature was 70.1° F., while that in January was 9.2° F.

Annual precipitation in Day County varied from a low of 12.54 inches in 1936 to a high of 28.91 inches in 1916. The average annual precipitation in Day County is 20.82 inches. Almost three-fourths of this amount falls during the growing season. (See Fig. 7).

The climate in Day County is favorable for the production of small grains, row crops, and forage crops. Early killing frosts in the fall make the production of corn for grain somewhat hazardous. Lack of rainfall during the latter part of the growing season when the small grains have just started to mature has resulted in low yields in some

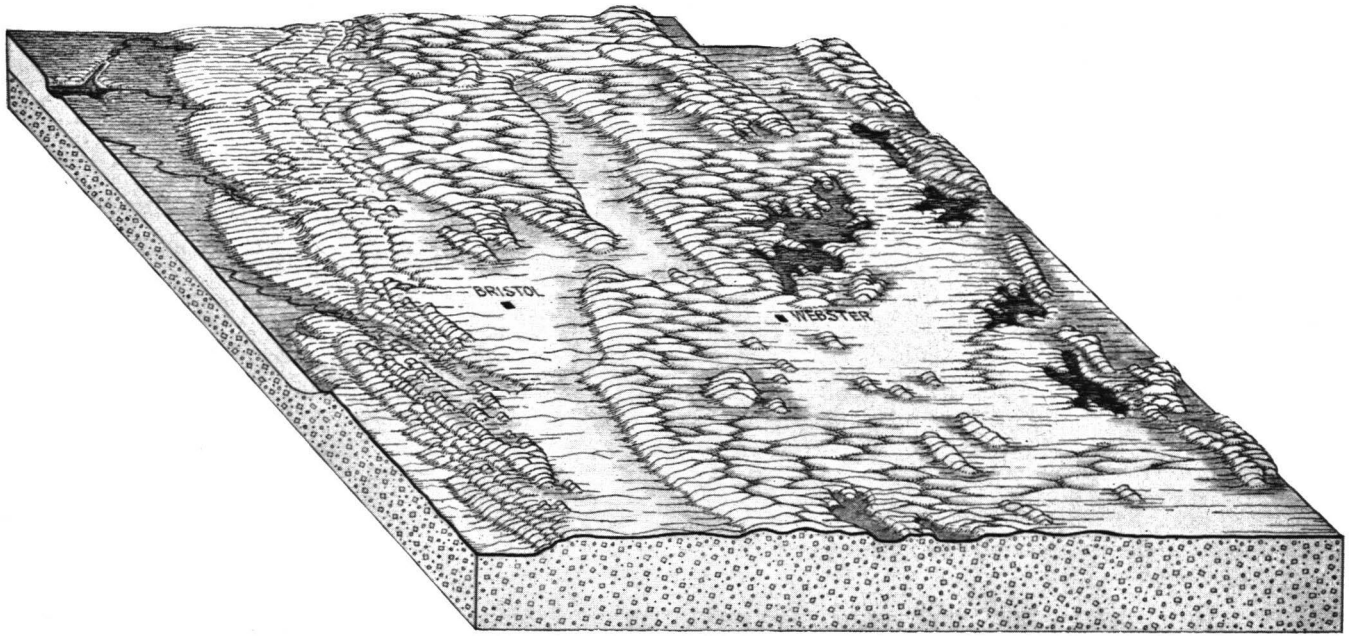


Fig. 6. Block diagram showing the landscape of Day County. The darkest areas in the eastern part of the county represent some of the larger lakes. The shaded portion in the northwest corner delineates the area formerly covered by old Lake Dakota. Between old Lake Dakota and the town of Bristol lies a series of hills. These hills are commonly referred to as the Bristol Moraine. Other morainic hills may be seen scattered throughout the county. The soils in the county have developed from glacial drift. This is shown in the diagram above by a series of dots, circles and squares at the edges

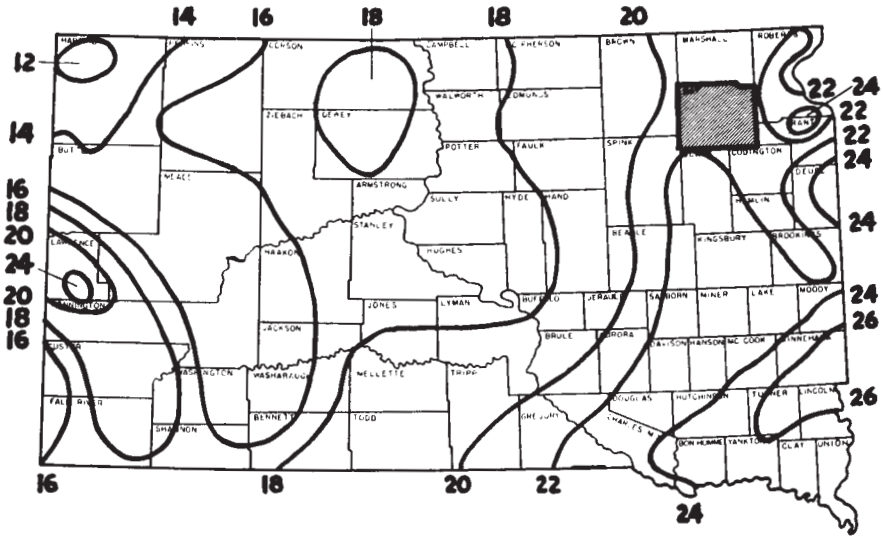


Fig. 7. Climate of Day County (note shaded area). Annual precipitation ranges from 20 to 22 inches, and averages 20.82 inches

years. Both tame and native forages do well. See Table 4 in appendix for more climatic data on Day County.

Early History and Development of Day County

The legislature of the Dakota Territory, in its session of 1873, established the boundary lines of Greeley County. Greeley County included the present counties of Day and Marshall, except for the townships of Egeland, Wheatland, Highland, York, Troy and Oak Gulch in Day County. The Territorial legislature of 1879 made a redivision of all of the counties and renamed this area in honor of Merrit H. Day. In December of 1881 Day County was organized. Four years later a bill was passed by the legislature which provided for the division of Day County north of township 124. The northern portion became Marshall County while the southern portion with the addition of Egeland, Wheatland, Highland, York, Troy and Oak Gulch townships became the present Day County. Webster was designated as a temporary county seat until 1886 when it became the permanent site for the county government.

The first white settler to come to this area was a fur trader by the name of Francis Randell. He established a post in Brown County in 1868, which still bears his name. Many of his descendents still reside in Day County.

The coming of the railroad in 1881 was the beginning for the towns of Webster, Waubay, Bristol, and Andover. Homesteaders began pouring into the county at that time. Early settlers were largely of Scan-

dinavian descent with Norwegians predominating. Scandinavian and German people quickly settled the area around the towns, and a Polish colony was etsablished in Kosciusko Township.

The 1950 census listed the population of Day County at 12,558. Approximately 43 percent of this population lived in towns and incorporated settlements. Webster, the county seat, is the largest settlement in the county with a population of 2,503. Other towns of importance, ranging from highest to lowest in population, are Waubay, Bristol, Pierpont, Andover, Roslyn, Grenville, Lily and Butler. The remaining 57 percent of the population in Day County live on farms or in unincorporated settlements. This rural farm population had a density of 6.6 persons per square mile in 1950.

Schools. School facilities in the county are good. In 1951, 78 rural schools, 7 independent schools of which 6 had a 4-year high school, 1 consolidated independent school, 2 parochial schools and 1 Federal Indian school were being operated in the county.

Transportation. Two railroads enter Day County. The main line of the Milwaukee Railroad runs east and west through the center of the county with two branch lines at right angles. One branch line starts at Andover and runs north through Pierpont, the other starts at Bristol and passes through Butler and Lily to the south. A branch line of the Minneapolis, St. Paul, and Sault Ste. Marie Railroad enters the northeast corner of the county. It passes through Roslyn and ends at Grenville. One federal and one state highway run through the county. Federal Highway No. 12 runs generally east and west through the center of the county. State Highway No. 25 runs north to Webster, where it intersects Highway No. 12. West of Bristol it leaves No. 12 and runs north through Pierpont to the county line. There is an excellent system of county trunk highways and a network of secondary roads which are adequate.

Farming in Day County

Agriculture is the principal enterprise of the county. The early settlers practiced general farming which is still the dominant type of farming carried on in the county today. Other types of farming which are carried on, listed in the order of their importance, are: livestock, cash grain, dairying and poultry.

According to the 1950 census, 94.9 percent of the county was in farms, of which 67.2 percent was in cropland, 26 percent was in grassland, 0.6 percent in woodland and 6.2 percent in miscellaneous items, such as farmsteads and roads. There were 1,723 farms in the county with an average size of 373.5 acres. Of these, 702 were operated by full owners, 584 by part owners and 437 by managers and tenants. The proportion of tenancy was much higher during the "thirties" and early "forties."

Agricultural Production

The principal crops grown in Day County in 1950, listed in order of importance by acreage, were as fol-

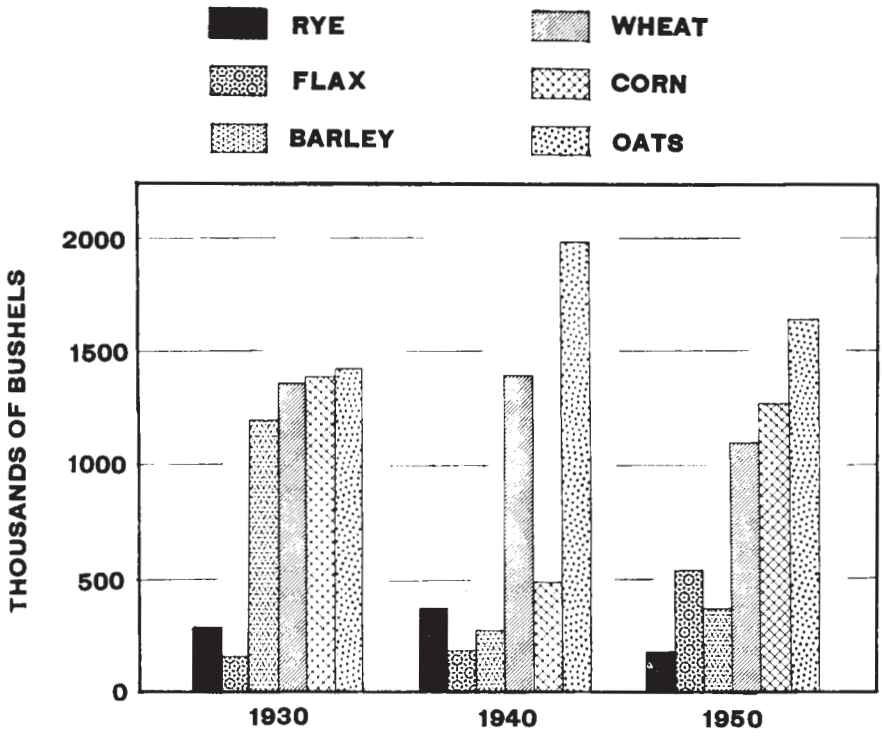


Fig. 8. The production of small grains in Day County has not varied appreciably in the last 20 years. There has been a slight increase in flax acreage and a large decrease in the barley acreage. The production of corn is more sporadic due to early frost hazard

lows: all wheat (spring, winter, durum), 108,990 acres; oats, 71,600 acres; flax for seed, 60,000 acres; wild hay, 57,800 acres; corn, 48,800 acres; alfalfa for hay, 30,100 acres; rye, 19,500 acres; barley, 18,100 acres; grain and other tame hay, 9,500 acres; sorghums (71 percent for silage and forage), 4,800 acres; clover and timothy hay, 500 acres; and potatoes, 350 acres. In 1949, 11,700 acres of alfalfa, and 700 acres of sweet clover were harvested for seed.[5]

The relatively high acreage used for the production of wild hay is due to two factors. Many depressional areas which are wet during a portion of the year are not suitable for cultivation but are used for the production of native grasses. In addition, native hay is cut on pasture and range land in years of above normal rainfall.

Farmers in Day County derive their largest cash income from the sale of livestock and livestock products. The sale of crops, such as wheat and flax, ranks second as a source of cash income.

[5]Statistics in this chapter are taken from the Crop Reporting Service Bulletin, "South Dakota Agriculture 1950."

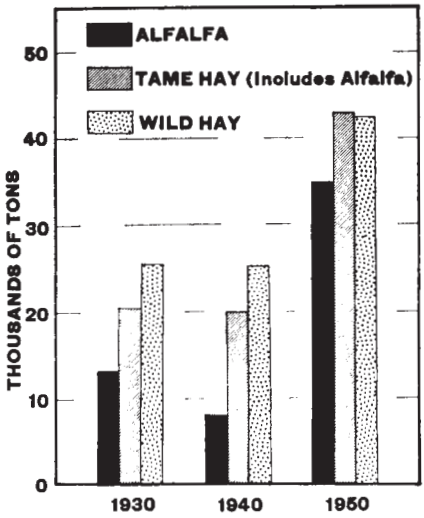


Fig. 9. The production of alfalfa for forage has increased appreciably during the last 10 years as can be seen in the bar graph above

Livestock population on farms on January 1, 1951, in order of importance by number, were as follows: cattle (35 percent milk cows and heifers), 37,200; sheep and lambs, 15,300; hogs, 15,100; horses and mules, 3,200.

Livestock populations on farms in Day County have remained fairly uniform for the last 20 years. The number of hogs raised each year fluctuates more than that for any other type of livestock. There has been a gradual decrease in the number of horses and mules in the county over the past 20 years.

Chickens are kept on many farms, mainly for eggs. On January 1, 1951, there were 198,600 chickens on Day County farms. Figs. 8, 9, and 10 show agricultural production in Day County.

Wild Life and Recreation

Day County with its many lakes, hills and plains, possesses a wide and diversified range of recreational opportunities for the average sportsman. The lakes and marshes provide a favorable propagation area for hordes of ducks and other migratory birds. Climatic conditions, natural haunts and good feeding grounds have favored the propagation of the Ringneck pheasant. Every fall, sportsmen come to this area to hunt ducks, geese and pheasants. Pike, bass, and other pan fish provide good fishing in the lakes scattered throughout the county. The many lakes and marshes also, provide favorable breeding grounds for fur bearing animals, such as mink and muskrat.

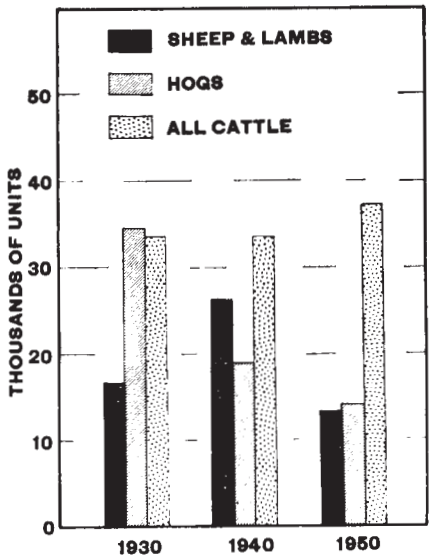


Fig. 10. The above graph indicates that sheep and lambs and cattle numbers have remained fairly constant during the past 20 years while hog populations have decreased

Picture by South Dakota Department of Game, Fish and Parks

A common scene in Day County. Note the muskrat house in the foreground. The ducks pictured are malards

Appendix Tables

Appendix Table 1. A Technical Summary of Some Important Characteristics and Management Problems of the Soils in Day County

Soil Type	Physiographic Position	Parent Material*	Topography or Relief	Drainage Surface†	
Aastad loam			Nearly level	Moderate-slow	1
Barnes loam			Undulating	Moderate	2
Barnes stony loam		Glacial till	Undulating	Moderate	3
Beadle silt loam			Gently undulating	Moderate	4
Buse loam			Rolling	Very rapid	5
Buse stony loam			Rolling	Very rapid	6
Kranzburg silt loam		Loess over Glacial till	Undulating	Moderate	7
Nutley silty clay	Upland	Lacustrine	Gently sloping	Moderate-slow	8
Nutley silty clay loam			Gently sloping	Moderate-slow	9
Parnell silt loam, poorly drained		Glacial till	Depressional	Very slow-ponded	10
Parnell silty clay loam, very poorly drained			Depressional	Ponded	11
Pierce gravelly sandy loam		Glacial outwash	Rolling	Very rapid	12
Sinai silt loam		Lacustrine	Undulating	Moderate	13
Sinai silty clay loam			Undulating	Moderate	14
Tolley loam		Glacial till and outwash	Undulating	Moderate	15
Waubay silt loam		Glacial till and lacustrine	Nearly level	Moderate-slow	16
Aberdeen complex		Lacustrine	Nearly level	Moderate-slow	17
Beotia silt loam			Gently undulating	Moderate-slow	18
Beotia silt loam, moderately deep over till		Lacustrine over glacial till	Gently undulating	Moderate-slow	19
Exline complex	Lake bed	Lacustrine	Nearly level	Slow	20
Fargo silty clay loam, saline phase	or		Level	Slow-very slow	21
Great Bend silt loam, moderately deep over till	lake terrace	Lacustrine over glacial till	Gently undulating	Moderate	22
Maple silty clay loam			Level	Slow-ponded	23
Tetonka silt loam, poorly drained		Lacustrine	Depressional	Very slow-ponded	24
Tetonka silt loam, very poorly drained			Depressional	Ponded	25
Egeland loam and sandy loam			Gently undulating	Moderate	26
Fordville fine sandy loam	Stream		Gently undulating	Moderate	27
Fordville loam	terrace	Glacial outwash	Gently undulating	Moderate	28
Foxhome sandy loam	or		Gently undulating	Moderate-slow	29
Sioux gravelly sandy loam	outwash		Gently undulating	Moderate-rapid	30
Sioux loam	plain		Gently undulating	Moderate-rapid	31
Sioux sandy loam			Gently undulating	Moderate-rapid	32
Lamoure silt loam, slightly saline		Recent	Level	Slow	33
Lamoure silty clay loam, moderately saline	Bottomland	alluvium	Level	Very slow	34
Rauville silty clay loam			Level	Very slow-ponded	35

*Glacial till consists of mixed boulders, sands, silts and clays. Loess is a blanket of windblown fine earth materials. Lacustrine deposits are fine earth materials which have been held down in and by water. Glacial outwash consists of mixed materials over stratified sands and gravels. Recent alluvium consists of water deposited sediments along major drainageways.

Appendix Table 1 (Continued). Technical Summary of Some Important Characteristics and Management Problems of the Soils in Day County

	Drainage Internal†	Drought Resistance	Erosion Hazard‡	Special Soil Management Problems
1	Moderate	Very good	Slight	No special problem
2	Moderate	Good	Moderate	Fertility maintenance and protection from water erosion on steeper slopes
3	Moderate	Good	Moderate	
4	Moderate-slow	Good	Moderate	Fertility maintenance
5	Moderate	Poor	High	Protection from water erosion on all slopes
6	Moderate	Poor	High	
7	Moderate	Good	Moderate	Fertility maintenance
8	Very slow	Fair	Moderate	Maintaining good surface tilth and internal drainage
9	Slow	Fair-good	Moderate	
10	Very slow	Very good	None	Good water management which includes adequate drainage
11	Very slow	Very good	None	
12	Very rapid	Very poor	Moderate	Protection from wind erosion
13	Moderate	Good	Moderate	Fertility maintenance and protection from water erosion on steeper slopes
14	Moderate-slow	Good	Moderate	
15	Moderate	Good	Moderate	
16	Moderate	Very good	Slight	No special problem
17	Slow	Fair	Moderate	Fertility maintenance
18	Moderate	Good	Moderate	Fertility maintenance
19	Moderate	Good	Moderate	Fertility maintenance
20	Very slow	Poor	Slight-moderate	Fertility maintenance
21	Very slow	Good	Slight	Good water management
22	Moderate	Good	Moderate	Fertility maintenance and protection from erosion
23	Very slow	Good	None	Good water management which includes adequate drainage
24	Very slow	Very good	None	
25	Very slow	Very good	None	
26	Moderate-rapid	Good	Moderate-severe	Fertility maintenance, protection from wind erosion, and moisture conserving practices by use of adapted crops.
27	Moderate-rapid	Fair-good	Moderate-severe	
28	Moderate-rapid	Good	Moderate	
29	Moderate	Fair	Moderate	Protection from wind erosion, maintenance and improvement of permanent cover
30	Very rapid	Very poor	Moderate-severe	
31	Moderate-rapid	Poor	Moderate-severe	
32	Rapid	Poor	Severe	
33	Moderate-slow	Very good	Slight	Protection from flooding
34	Slow	Very good	None	
35	Very slow	Very good	None	

†Moderate to moderately slow surface and internal drainage is the optimum or most desirable surface for soils in this area.
‡Erosion hazard refers to the susceptibility of soil types to erode when cultivated.

Appendix Table 2. Index of Soils and Soil Associations in Day County, South Dakota, According to Restrictions Upon Land Use

Name	Slope	Erosion	Map Symbol
Good land, subject to moderate limitations			
Barnes and Aastad loam	A, B	1, 2	2
Barnes loam	A, B	1, 2	3
Beotia silt loam	A, B	1, 2	7
Egeland loam and sandy loam	A, B	1, 2	10
Fordville loam	A, B	1, 2	14
Great Bend and Beotia silt loams, moderately deep over till	A, B	1, 2	17
Kranzburg silt loam	A. B	1, 2	18
Nutley silty clay loam	A, B	1, 2	23
Sinai silty clay loam	A, B	1, 2	29
Sinai and Waubay silt loams and Barnes loam	A, B	1, 2	30
Tolley loam	A, B	1, 2	37
Fair land, subject to severe limitations			
Aberdeen complex	A, B	1, 2	1
Barnes loam	C	2	3
Beadle silt loam	A, B	1, 2	6
Fordville fine sandy loam	A, B	1, 2	13
Fordville and Sioux loams and sandy loams	A, B	1, 2	15
Lamour silt loam, slighty saline	A	1	19
Nutley silty clay	A, B	1, 2	22
Nutley silty clay loam and Buse loam	A, B	1, 2	24
Sinai silty clay loam	C	2	29
Sinai and Waubay silt loams and Barnes loam	C	2	30
Land subject to severe limitations and suitable only for occasional cultivation			
Exline complex	A, B	1, 2	11
Fargo silty clay loam, saline phase	A	1	12
Parnell silt loam, poorly drained	A	1	25
Tetonka silt loam, poorly drained	A	1	35
Land not suited for cultivation because of wetness or flooding hazard			
Lamoure silty clay loam, moderately saline	A	1	20
Maple silty clay loam	A	1	21
Parnell silty clay loam, very poorly drained	A	1	26
Rauville silty clay loam	A	1	28
Tetonka silt loam, very poorly drained	A	1	36
Land suited only for grazing or permanent hay			
Barnes loam	C	3	3
Barnes loam and Pierce gravelly sandy loam	B, C, D	1, 2, 3	4
Barnes stony loam	B, C	1, 2	5
Buse and Barnes loam	C, D	1, 2, 3	8
Buse stony loam	C, D	1, 2	9
Foxhome sandy loam	A, B	1, 2	16
Pierce gravelly sandy loam	B, C, D	1, 2	27
Sioux and Fordville gravelly sandy loams and sandy loams	A, B	1, 2	31
Sioux gravelly sandy loam	A, B, C	1, 2, 3	32
Sioux loam	A, B, C	1, 2, 3	33
Sioux sandy loam	A, B, C	1, 2, 3	34
Land suited for wildlife or recreation			
Intermittent lakes and ponds	A	1	

Appendix Table 3. Estimated Acreage and Proportionate Extent of Soil Types and Associations Mapped in Day County, South Dakota

Map Symbol	Soil Types and Associations	Acres In County	Percent Of County
1	Aberdeen complex	7,232	1.1
2	Barnes and Aastad loams*	71,360	10.9
3	Barnes loam	83,144	12.74
4	Barnes loam and Pierce gravelly sandy loam	3,200	.5
5	Barnes stony loam	2,790	.4
6	Beadle silt loam	380	.06
7	Beotia silt loam	10,880	1.7
8	Buse and Barnes loam	41,600	6.4
9	Buse stony loam	5,440	.8
10	Egeland loam and sandy loam	12,800	1.9
11	Exline complex	1,920	.3
12	Fargo silty clay loam, saline phase	2,886	.4
13	Fordville fine sandy loam	9,600	1.5
14	Fordville loam	23,040	3.6
15	Fordville and Sioux loams and sandy loams	7,680	1.2
16	Foxhome sandy loam	8,320	1.3
17	Great Bend and Beotia silt loams, moderately deep over till	59,502	9.3
18	Kranzburg silt loam	2,432	.4
19	Lamoure silt loam, slightly saline	10,560	1.6
20	Lamoure silty clay loam, moderately saline	1,344	0.2
21	Maple silty clay loam	13,472	2.1
22	Nutley silty clay	4,480	.7
23	Nutley silty clay loam	5,860	.9
24	Nutley silty clay loam and Buse loam	704	.1
25	Parnell silt loam, poorly drained	11,620	1.8
26	Parnell silty clay loam, very poorly drained	46,664	7.2
27	Pierce gravelly sandy loam	15,260	2.4
28	Rauville silty clay loam	1,280	0.2
29	Sinai silty clay loam	6,528	1.0
30	Sinai and Waubay silt loams and Barnes loam	91,820	14.2
31	Sioux and Fordville gravelly sandy loams and sandy loams	2,170	.3
32	Sioux gravelly sandy loam	5,184	.8
33	Sioux loam	5,760	.9
34	Sioux sandy loam	5,568	.9
35	Tetonka silt loam, poorly drained	7,140	1.1
36	Tetonka silt loam, very poorly drained	4,800	.8
37	Tolley loam	2,688	.4
	Intermittent lakes	22,808	4.4
	Miscellaneous lakes, dams, gravel pits, towns, roads, etc.	22,976	3.5
	TOTAL	648,792	100.0

*Where two or more soils occur in an association, the soil types are arranged so that the most prominent soil or soils occur first in the series.

Appendix Table 4. Last Killing Frost in the Spring, First Killing Frost in the Fall and Annual Precipitation in Day County, South Dakota

Year	Killing Frosts*		Annual Precipitation
	Last in Spring	First in Fall	in Inches*
1941	May 8	October 10	25.04
1942	May 4	September 24	25.62
1943	May 13	September 10	24.70
1944	May 6	October 10	23.72
1945	May 9	September 29	19.30
1946	May 15	October 8	28.01
1947	May 30	September 22	16.96
1948	May 6	October 9	20.28
1949	May 24	October 14	20.11
1950	May 10	November 2	19.61

*Taken from the Annual Summary of Climatological Data, South Dakota.

Other Temperature and Precipitation Data Taken from a 38-Year Record at the Weather Station Near Webster

Temperature		Precipitation in Inches	
January average	9.2° F.	Winter average	1.51
July average	70.1° F.	Spring average	7.16
Maximum	108.0° F.	Summer average	9.13
Minimum	−44.0° F.	Fall average	3.02
		Annual average	20.82

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R56W R55W R54W R53W

T124N T123N T122N T121N T120N

ROSLYN GRENVILLE WEBSTER POP 2503 WAUBAY POP 573

PICKEREL LAKE ENEMY SWIM LAKE WAUBAY LAKES SPRING LAKE WASTE LAKE BLUE DOG LAKE RUSH LAKE BITTER LAKE

U.S. HWY 12 STATE HWY 25

Soil Association Map of Eastern Half of

DAY COUNTY

SOUTH DAKOTA

Scale—1 inch equals 1 mile

Agronomy Department, South Dakota State College, Brookings; In Cooperation with the Soil Conservation Service and the Bureau of Plant Industry, Soils and Agricultural Engineering, U. S. D. A.

To save space, abbreviations of soil types and associations have been used on the soil map. The first or top number in the mapping symbol indicates what soil or soils are found within that soil boundary. Where only the soil symbol has been placed on the map, areas are level or nearly level and there has been no erosion. Many of the small Tetonka and Parnell soil areas were too small to place a symbol in. These small depressions are indicated on the map by small circular areas with a line through the center.

The letters between the numbers inside of the soil boundaries indicate the slope of the land.

The numbers following the letters indicate the erosion.

The example below will show you how to interpret the mapping symbols shown on the soil map:

3 C 2 =	3 Barnes Soil	C 5—8% Slope	2 Moderate Erosion

DAY COUNTY LEGEND

May Symbol	Soil type or association
1	Aberdeen Complex
2	Barnes-Aastad loams
3	Barnes loam
4	Barnes loam—Pierce gravelly sandy loam
5	Barnes stony loam
6	Beadle silt loam
7	Beotia silt loam
8	Buse-Barnes loam
9	Buse stony loam
10	Egeland loam and sandy loam
11	Exline Complex
12	Fargo silty clay loam, saline phase
13	Fordville fine sandy loam
14	Fordville loam
15	Fordville-Sioux loams and sandy loams
16	Foxhome sandy loam
17	Great Bend-Beotia silt loams, moderately deep over till
18	Kransburg silt loam
19	Lamoure silt loam, slightly saline
20	Lamoure silty clay loam, moderately saline
21	Maple silty clay loam
22	Nutley silty clay
23	Nutley silty clay loam
24	Nutley silty clay loam and Buse loam
25	Parnell silt loam, poorly drained
26	Parnell silty clay loam, very poorly drained
27	Pierce gravelly sandy loam
28	Rauville silty clay loam
29	Sinai silty clay loam
30	Sinai-Waubsy silt loams—Barnes loams
31	Sioux-Fordville complex (gravelly sandy loams and sandy loams)
32	Sioux gravelly sandy loam
33	Sioux loam
34	Sioux sandy loam
35	Tetonka silt loam, poorly drained
36	Tetonka silt loam, very poorly drained
37	Tolley loam

Erosion has been classified as:

- Slight 1
- Moderate 2
- Severe 3

Slope groups have been classified as:

- A ..... 0—2%
- B ..... 2—5%
- C ..... 5—8%
- D ..... 9% plus

CONVENTIONAL SIGNS

- County Boundary
- Hard Surface Road
- Gravel Road
- Dirt Road
- Trail
- Section Line
- Railroad
- Houses
- School Houses
- Church
- Cemeteries
- Gravel Pits
- Dams
- Escarpments
- Permanent Lakes (Blue)
- Intermittent Lakes (Blue)
- Intermittent Streams (Blue)
- Drainage Ditches (Blue)
- Small Depressions — Wet (Black), Very Wet (Blue)
- Wet Spots (Blue)
- Soil Boundaries

R 59 W

R 58 W

R 57 W

T 124 N

T 123 N

T 122 N

T 121 N

T 120 N

PIERPONT

ANDOVER

CHICAGO

MILWAUKEE

BUTLER

LILY

CRANDALL

Soil Association Map of Western Half of

DAY COUNTY

SOUTH DAKOTA

Scale—1 inch equals 1 mile

Agronomy Department, South Dakota State College, Brookings; In Cooperation with the Soil Conservation Service and the Bureau of Plant Industry, Soils and Agricultural Engineering, U. S. D. A.

To save space, abbreviations of soil types and associations have been used on the soil map. The first or top number in the mapping symbol indicates what soil or soils are found within that soil boundary. Where only the soil symbol has been placed on the map, areas are level or nearly level and there has been no erosion. Many of the small Tetonka and Parnell soil areas were too small to place a symbol in. These small depressions are indicated on the map by small circular areas with a line through the center.

The letters between the numbers inside of the soil boundaries indicate the slope of the land.

The numbers following the letters indicate the erosion.

The example below will show you how to interpret the mapping symbols shown on the soil map:

3 C 2 =	3	C	2
	Barnes Soil	5—8% Slope	Moderate Erosion

DAY COUNTY LEGEND

May Symbol	Soil type or association
1	Aberdeen Complex
2	Barnes-Aastad loams
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10	Egeland loam and sandy loam
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28	Rauville silty clay loam
29	Sinai silty clay loam
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32	Sioux gravelly sandy loam
33	Sioux loam
34	Sioux sandy loam
35	Tetonka silt loam, poorly drained
36	Tetonka silt loam, very poorly drained
37	Tolley loam

Erosion has been classified as:

Slight	1
Moderate	2
Severe	3

Slope groups have been classified as:

A	0—2%
B	2—5%
C	5—8%
D	9% plus

CONVENTIONAL SIGNS

- County Boundary
- Hard Surface Road
- Gravel Road
- Dirt Road
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- Railroad
- Houses
- School Houses
- Church
- Cemeteries
- Gravel Pits
- Dams
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- Intermittent Lakes (Blue)
- Intermittent Streams (Blue)
- Drainage Ditches (Blue)
- Small Depressions — Wet (Black)
- Very Wet (Blue)
- Wet Spots (Blue)
- Soil Boundaries